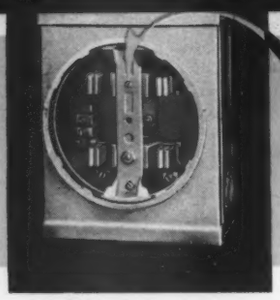
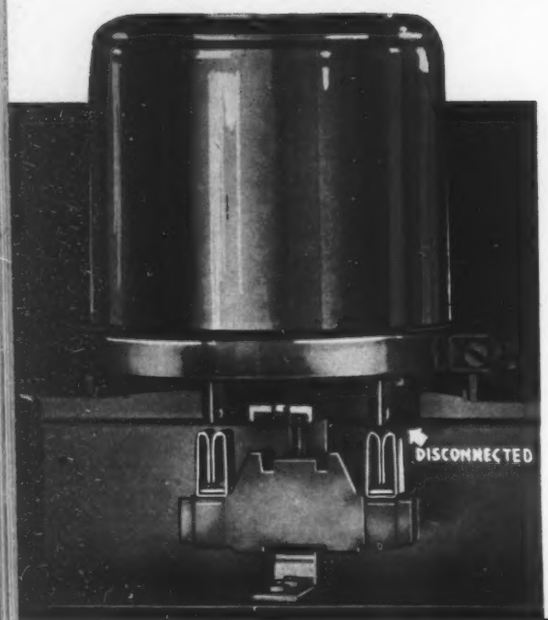


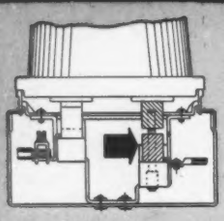
New!

DEVELOPED SOLELY FOR SOCKET METERS

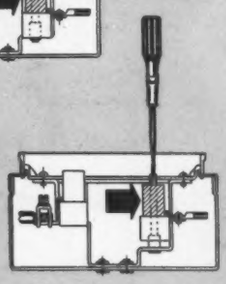
FASTER TO DISCONNECT • ONE SCREW DOES THE WHOLE TRIC



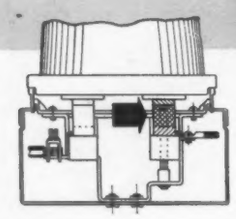
Just a **single** screw (the red arrow in the picture above points to it) is **all** that need be turned for **complete** DISconnection or connection. The action is smooth, quick, positive—and tamperproof! No wiring within the Murray trough is disturbed. The photographs and the diagrams show clearly the clean-cut operation of the Murray Disconnect. Send the coupon below for the new Murray Disconnect Meter Trough book—just off the press. It covers this and other Murray Meter Troughs in detail, with plenty of explanatory pictures. Yours for the asking. Metropolitan Device Corporation, Brooklyn, New York.



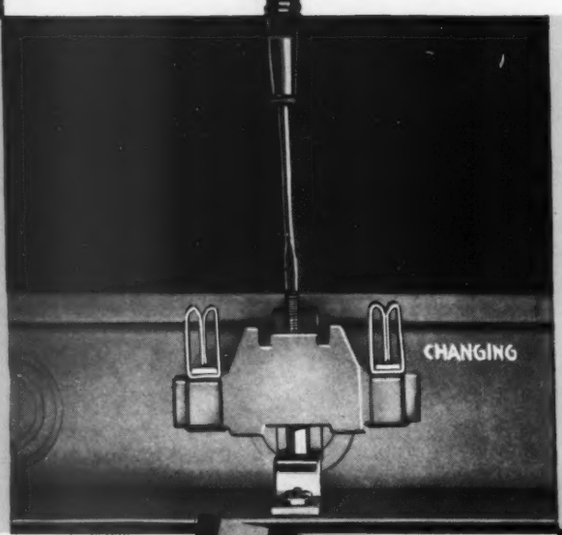
The porcelain - mounted jaws rise or fall as a unit when the Murray Disconnect Screw is turned. Note complete separation of blades and jaws.



Meter removed to reveal Disconnect Screw. Any screwdriver will make the adjustment.



Murray Disconnect Screw Raises jaws into contact.



MURRAY
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Socket meter troughs

METROPOLITAN DEVICE CORPORATION

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Please send 20-page illustrated booklet describing Murray Disconnect and other types of Socket Meter Troughs.

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Initiative

Through the filing of a sufficient amount of securities of the different properties the way is now clear for transit unification in New York City under municipal ownership and operation. The thing, however, that is bothering Mayor LaGuardia is finding a man capable of taking over the management of the unified system at a salary that the city can pay. If the man were to be offered even as much as the Mayor receives, it would still be but a small part of what the job would pay under private operation.

Nor is this an isolated example. Government positions are notoriously poor pay. According to the last census, 1937, the average compensation for employees of municipal electric utilities was $1,463. For privately owned utilities it was $1,722, or 18 per cent more.

A man will be found for the New York transit job. Maybe he will be just as good as though he were paid twice as much. He will be surrounded, however, all through the system with men who will be paid less than comparable jobs under private ownership would pay. Are these men going to be equally capable?

Public operation apparently attaches no fixed limitation to the gross amount paid out for labor, only for that paid to the individual. For that reason the number of employees in a public operation is apt to exceed that under private operation. The 1937 census showed, for instance, one employee for every 376 thousand kilowatt-hours sold to the ultimate consumers for private ownership and 260 thousand kilowatt-hours for public ownership. This gives a difference of 45 per cent more employees per unit of sale by municipal utilities.

There are many excellent men in public operation of utilities. How many of them are utility men, however, and how many are men who have chosen government work as a career? Perhaps the more important qualification for such a job is the ability to steer a straight path past political reefs and shoals.

The only point we wish to make is that private initiative, because of the profit motive, must operate efficiently. It therefore requires more of its employees—and it pays them more. It operates on the theory that in the long run you get about what you pay for. That incentive plays just as much a part in the life of the individual as it does in the welfare of the company. Under this system there is competition on the basis of ability for the management jobs of tomorrow. This training insures a continuity of experienced management.

Under which of these two systems in the long run can the public expect the better service and lower over-all cost?

This year, in the scramble for votes, political promises will be made, some of which will have a bearing on private ownership. Apart from all partisan politics, the public should understand what it loses when private initiative is stifled.

Rivesville Topping Reduces B.t.u. per Kw.-Hr. One-Third

Same building houses three-fifths more capacity — Same operating force — Water comprehensively treated — Steel turbine foundation fabricated under tension for rigidity

W. V. DRAKE, *Manager of Power Generation*
Monongahela West Penn Public Service Company, Fairmont, W. Va.

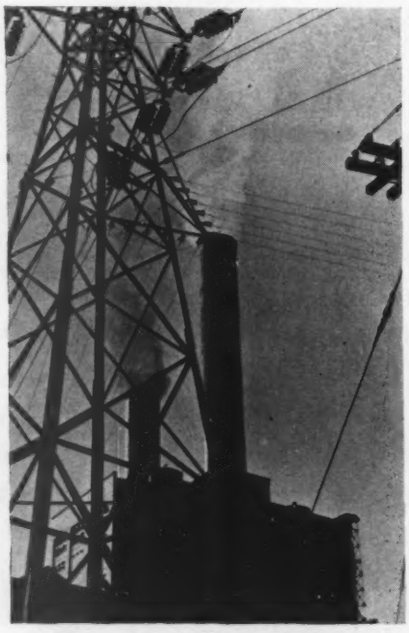
THE TOPPING of the Rivesville plant, at Fairmont, W. Va., illustrates well the usefulness of this cheap and efficient method of increasing power station capacity, mainly because the old plant was simple and typical of many others, because a 60 per cent gain in capacity was made with no increase of building area nor interruption of service, and because it was necessary to obtain from a polluted source water safe for use as feed for 1,425-lb. boilers.

The new installation has now been in commercial operation long enough to show the gains made (see accompanying table), free of the disturbing effects of the starting and preliminary operating periods. A comparison of the present plant with the old plant is shown graphically. In round figures, the output has been doubled with an increase of only 30 per cent in fuel consumption and of 40 per cent in power production cost. This implies very low fuel consumption for the new capacity, a result obtained by reason of the very high efficiency of the non-condensing topping turbine, in conjunction with the increase in efficiency at which steam is now produced. The magnitude of the gains possible by any topping job of course depends greatly on the efficiency of the old plant. If a very inefficient plant is topped the added capacity may actually be obtained with zero fuel consumption, and at no other cost than the fixed charges on the added capacity.

The Rivesville plant contained six stoker-fired boilers operating at 250 lb. pressure and three condensing steam turbines totaling 40,000 kw. It was built in 1919 and 1921 and was far from obsolete, but the topping extension nevertheless shows very substantial economies.

Greatly Improved Fuel Economy

The old plant required a little more than 1½ lb. of coal per kilowatt-hour; the enlarged plant, including both the new and old equipment, produces a kilowatt-hour on close to one pound of coal. In the old plant there were usually in operation five boilers and three turbines, compared with two boilers and four turbines at present. There is a material reduction in the labor cost per kilowatt-hour, as the operating and maintenance force is about the same as it was, but now produces a larger output.

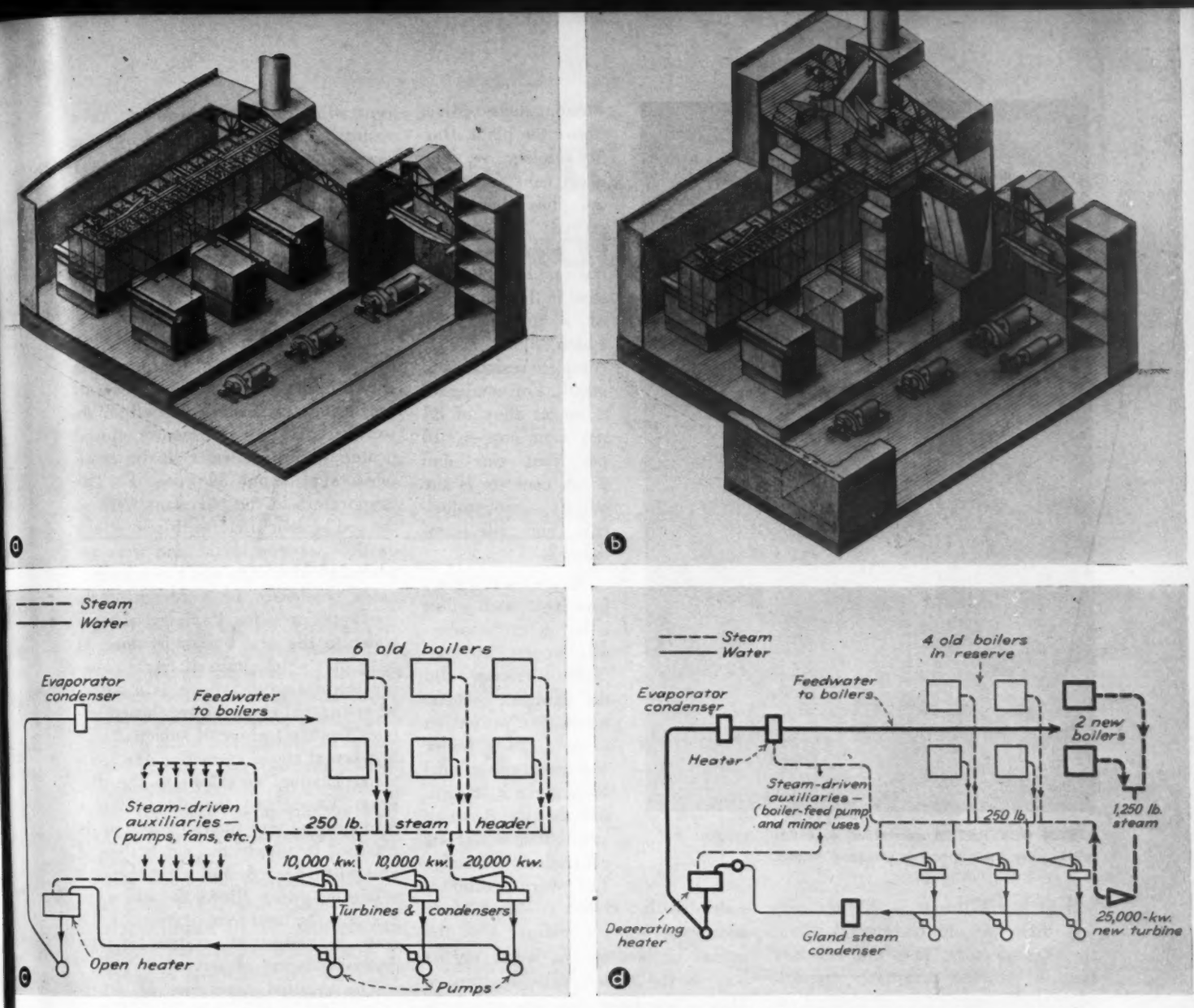


TOPPING UNIT is on the line

Two of the six old boilers were removed and sold, two modern boilers substituted and a new 25,000-kw. turbine installed alongside one of the old turbines. The old and new schemes of operation are shown by the diagrams. The four old boilers are still operable and the new boilers may furnish steam, by connections not shown, to the old turbines, so continuity of service is not dependent on the new equipment.

The floor area of each of the new boilers is almost exactly the same as that of one of the old ones; the additional area occupied by the old stoker hoppers was only slightly less than that taken by the new coal pulverizers and blowers. Each of the new boilers will produce 2½ times the amount of steam obtainable from one of the old boilers, with 15 per cent less coal per pound of steam. To obtain this result the assembly, consisting of the boiler, furnace, economizer, air heater and superheater, is made tall, going from a foundation at the level of the old ash cellar to a fan floor 119 ft. above, covered by a 51-ft. vertical extension over 45 per cent of the boiler house. The stack for the two old boilers removed was left in place and connected to the two new boilers.

The boiler has a two-stage furnace



OUTPUT DOUBLED BY TOPPING with only 40 per cent increase in production cost—(a) (c) The arrangement of equipment and piping for the 40,000-kw. plant built 1919–21. (b) (d) A 25,000-kw. topping unit cuts the fuel rate to 1 lb. New equipment and 1,425-lb. piping shown in heavy lines in (d)

of such size that the over-all heat liberation rate is about 35,000 B.t.u. per cubic-foot at normal maximum continuous output of 315,000 lb. of steam per hour. The coal burned is West Virginia bituminous having about 36 per cent volatile matter, 8 per cent ash, 13,600 B.t.u. as fired and ash softening temperature of 2,100 deg. F. The furnace is of the slagging type, with continuous molten ash discharge to the sluice.

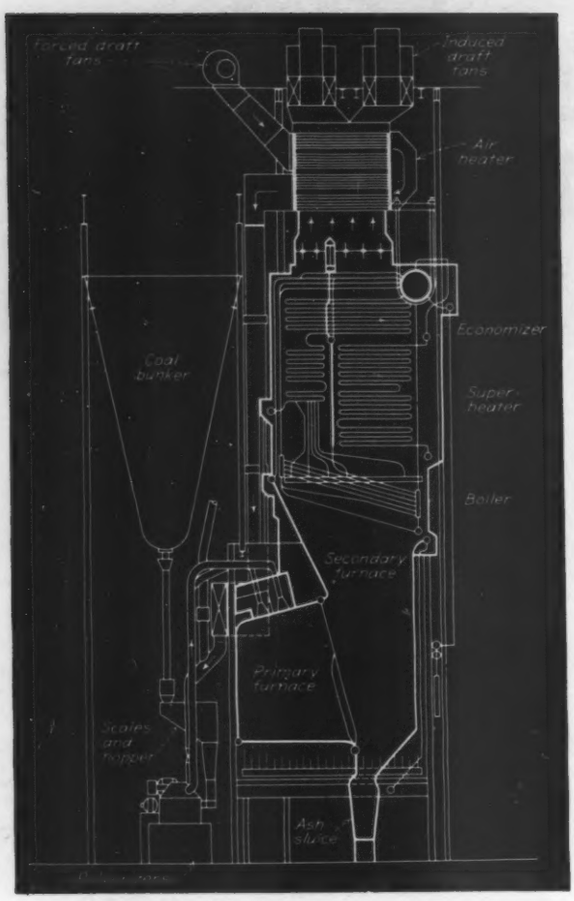
The 1,300-ton weight of each of the new boiler assemblies could not have been supported on the concrete foundation for the old boiler house and equipment. Sufficient bearing was obtained without disturbing nearby column footings, and with removal of only small portions of the basement mat, by cutting openings in it for circular concrete piers carried to rock, a maximum distance of 29 ft. The form for each pier consisted of a series of telescoping open-end steel plate cylinders each about 3 ft. long. The largest diameter cylinder was set first through a hole in the mat and driven by hand as the earth inside it was removed. Then the second and additional sections were set inside the first, until rock was reached, when the whole was filled with concrete, which was bonded to the mat.

Rivesville Station

	1935	1939
Cubic feet of building per kw.	76.5	59.9
Square feet of building per kw.	0.78	0.48
Performance—First eleven months 1935 vs. 1939		
Net output, kw.-hr.	171,456,000	328,083,000
Coal, total short tons	130,860	167,860
Coal, lb. per kw.-hr.	1.53	1.02
Station efficiency, per cent	16.4	24.2
Station heat rate, B.t.u. per net kw.-hr.	20,730	13,965

Coal could have been supplied to the new pulverizers as it was to the old stokers, from the central bunker running lengthwise of the boiler house. However, this would not have given an immediately available coal supply commensurate with the new boiler capacity, so a new bunker was added across the end of the old boiler house. The old and new coal conveyors are so interconnected that the new bunker may be filled from two sources.

The new turbine was placed in the turbine room as near as practical to the new boilers from which it gets all its steam. Its steel foundation rests on the old water tunnels. Its



STEAM GENERATOR assembled essentially vertical to utilize only floor space of removed boilers

weight per kilowatt is 45 per cent less than the old turbines, without their conductors, and the concrete tunnels provide adequate support, after their roof was reinforced at four points by steel beams.

Much Old Equipment Reused

The old Rivesville plant, like every other, was sufficiently full of piping, auxiliary equipment, elevators, etc., to make the clearing out of 40 per cent of the boiler house and of a small part of the turbine room basement, a problem to be studied and planned to avoid interruptions. The equipment moved and reused includes an elevator, exciter, boiler feed and service pumps, compressor, forced-draft fans, tanks and much associated piping and wiring. The larger sections of the work were inclosed by dust-tight partitions to allow maximum speed of construction with protection of the operating machinery.

The acid condition of the river water used for all purposes in the station is due to coal mines, glass and other manufacturing plants in the industrial districts along the Tygart Valley River and the west fork of the Monongahela River above the plant. During summer low water a pH value as low as 2.7 has been observed; pH 4.0 or less occurs very frequently. Stainless steel is the only alloy of a number tried which offers nearly complete resistance to attack. For condenser tubes an alloy of 88 per cent copper, 10 per cent zinc and 2 per cent tin is the most economical, cost and life considered.

Contamination from such water entering the condensate system by condenser leakage and the stringent requirements for protection of the 1,425-lb. boiler and economizer surfaces make it imperative that the make-up and boiler water be controlled exactly. The very complete water-treating system is shown in an accompanying illustration, also the means of heating the water on its way to the boilers. The continuous blow-down from the evaporator is used for recirculation to the hot process softener, instead of recirculation from the boiler, as is frequently used with this type of equipment, and also to maintain low concentration in the evaporator. As a result, cracking of scale from the evaporator coils may be done only at three- or four-week intervals.

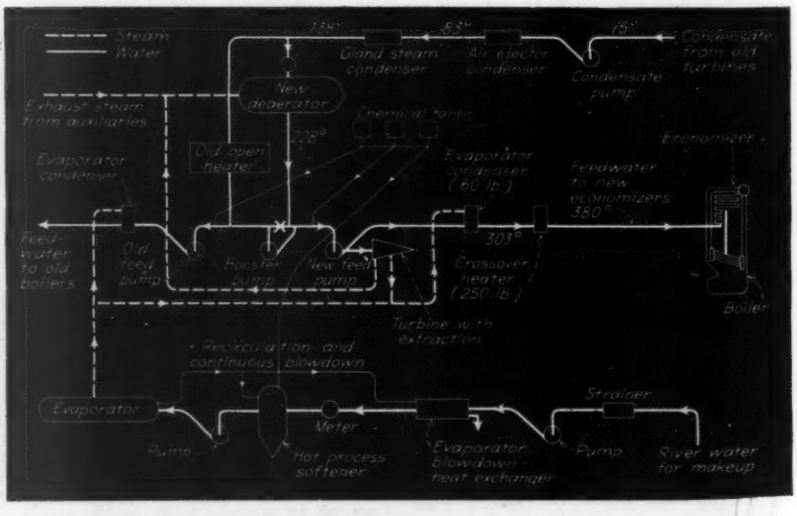
Condition of the water in the boilers is controlled by continuous blow-down and feeding of chemical to the high pressure feed pump suction.

Old Equipment Retained

The method of utilizing much of the old water-heating equipment is shown in the diagram. A new deaerating heater was installed to eliminate oxygen and a high-pressure closed heater to furnish water to the economizers at about 395 deg. F. The evaporators in the old plant were at the end of their life, due to acid attack on the cast iron shells, and were replaced by new units and a new evaporator condenser built for 1,500-lb. feedwater pressure. Pumping of feedwater to the new boilers is done at only one point, immediately following the deaerator, which is a somewhat unusual arrangement. It necessitates a pump turbine of sufficient size to warrant steam extraction for feedwater heating, as shown in the diagram. Enough of the old (300-lb.) feed heating and pumping system is retained to supply the old boilers if and when needed, and a tie through a booster pump allows the old open heater to be used temporarily for the new high-pressure system if the deaerator is out of service.

The unusual procedure of fabricating the steel turbine foundation with its bracing under initial tension was followed, to secure the utmost tightness and freedom from movement, particularly in view of the

[*Continued on page 108*]



WATER TREATMENT combined with feed-heating system

Thermocouples Take Turbine Temperatures

Measurement of steam flow by the temperature-drop method is facilitated by development of special thermocouple equipment and technique

B. O. BUCKLAND and S. S. STACK, General Electric Company, Schenetady, N. Y.

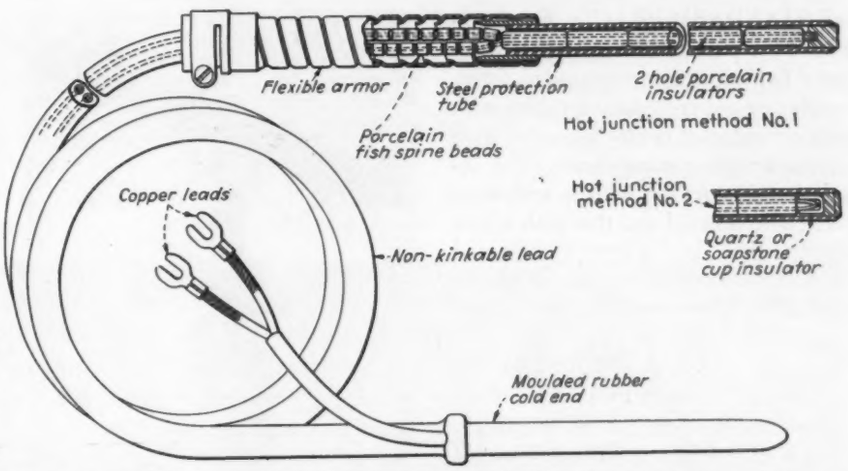
ADVANCES in the art of power generation, including higher steam temperatures and pressures in turbines for new central stations and superposed units for existing plants, have resulted in a complexity of power plant piping. This has complicated the measurement of steam flow in using the load-flow method to determine steam rate in turbine performance tests.

The temperature-drop method, in which the initial and final enthalpies are established by temperature and pressure measurements, has thus increased in usefulness. To make this method more reliable, a thermocouple technique has been developed which results in satisfactory agreement between turbine performances measured by the two methods.

Thermocouples were used instead of mercury-in-glass thermometers because they eliminate the necessity for making stem corrections and usually are more easily and conveniently read. While the precision obtainable with the platinum resistance thermometer is desirable, it has not been thought discreet to use this device for turbine-testing up to the present.

In developing this technique, the goal has been to measure steam temperature in the field up to 1,000 deg. F. within 1 deg. F. or better. These steps have been taken toward this goal: (1) Reliable platinum resistance thermometer is used as a calibration standard; (2) each couple is carefully calibrated against this standard when it is first made up and also before each turbine test; (3) precision-type potentiometer, instead of the more usual portable instruments, is used for measuring the potential of the couples when they are set up in the field; (4) materials and methods of construction are used which facilitate the production of thermocouples that are relatively insensitive to depth of immersion and that maintain their calibration over a reasonable period.

The resultant thermocouple is illustrated in an accompanying diagram. Proper lead insulation—tellurium-compounded rubber — was found necessary. Thorough cleansing before assembly and aging before use—4 hours at 1,200 deg. F.—is essential. Test data using the thermocouples show that independent measurements of steam temperatures at a turbine throttle agree within ½ deg. F. or less at 900 deg. F. and similar measurements at the turbine exhaust agree within 1 deg. F. or less at 600 deg. F. The increased discrepancy shown in the lower value exhaust temperatures is probably due to conduction effects.



Thermocouples prove adaptable in testing back-pressure turbines in factory and field

These thermocouples are made of Chromel (90 per cent nickel, 10 per cent chromium and Copnic (55 per cent copper, 45 per cent nickel) wires, 40 to 30 ft. long between cold and hot junctions. Continuous wires are used to prevent errors due to temperature gradients at connection points. Two methods of making the hot junction are used — uninsulated (No. 1) and insulated (No. 2). Cover for the round lead is tellurium-compounded rubber to make it waterproof and oil resistant. Numbered aluminum tags fastened to both the cold and hot ends serve to identify the individual couples and make it easy to keep track of their locations when a number of them are being connected to one transfer switch.

*Adapted from paper presented at temperature symposium sponsored by the American Institute of Physics. Complete report of the symposium is to be published in book form by the institute.

Pole Riser Cables With Corona-Resisting Compound

Single-conductor cables with lead sheath in fiber duct give excellent performance in Buffalo's underground to overhead connections

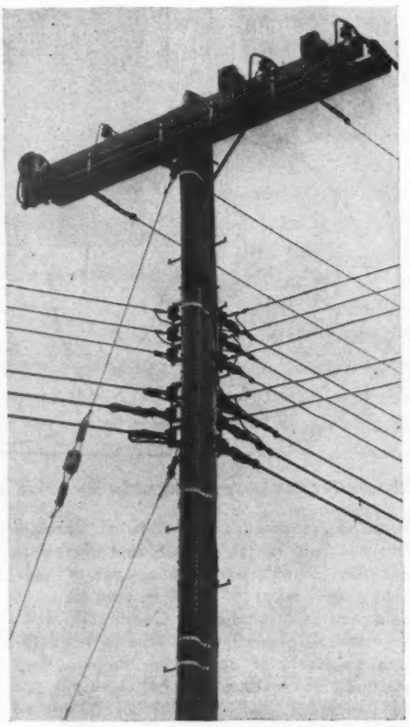
T. J. BROSNAN,* Distribution Engineer Buffalo Niagara Electric Corporation

AS STANDARD PRACTICE for 2.3- and 4-kv. pole riser cables this company five years ago superseded three-conductor paper-insulated cables with single-conductor cables insulated with corona-resisting compounds. The insulation is covered with a well-saturated cotton braid and this with a lead sheath that is, however, removed from the portion of cable beyond the end of the fiber conduit at the top of the pole. Experience with this type of riser cable has been very satisfactory and there has been only one failure in a total of some 800 installations. This is at the rate of 0.04 failure per 100 pole-riser years of operation and substantially improves former experience in what is regarded as one of the most vulnerable portions of distribution feeders, because the cables at these transition points are exposed to all the destructive forces that prevail in both the overhead and underground systems.

The one failure experienced occurred during a severe lightning storm. The power-follow current destroyed the evidence, but it is assumed that lightning caused the failure.

Importance of Pole Riser Cables

Our generating stations, transmission systems and substations are all provided with reserve circuits and equipment and automatic switching equipment. In case of failure of any part, that part is promptly isolated without interruption of service. It is economically impractical to provide corresponding reserve facilities beyond the substation except for the supply to certain high-load-density areas such as the downtown business sections.



POLE RISERS are lead-covered single-conductor cables insulated with corona-resisting compound

1. Each "phase" cable is terminated in a cutout box.
2. The lead sheath is removed starting at a point below the top of the vertical fiber. This leaves a braid-covered cable from that point over to the cutout boxes.
3. The individual single-conductor cables are carried in separate fiber ducts in the horizontal run under the crossarm in order to insure good mechanical protection and positive separation.
4. Every pole riser installation has lightning protection. The arresters are mounted between the crossarms.
5. The vertical fiber conduit is left open at the top in an effort to promote the circulation of air through the conduit.

As a consequence, failures in the 2,300-volt and 4,000-volt feeders cause by far the largest number of customer-hours of interruption. Faults in these feeders probably account for at least 75 per cent of all the customer outages in our urban systems. The most serious of the distribution feeder faults are those which occur in the underground cable sections of the feeders because of the time required to locate the faulty section and isolate to make the necessary repairs. There are approximately 2,000 locations where pole riser cables are used to join the underground and overhead portions of the 2,300- and 4,000-volt feeders in the Buffalo district of the Buffalo Niagara Electric Corporation. The number of such installations is growing at the rate of about 75 per year.

Type of Construction Used

Up to about five years ago all of the pole risers in the Buffalo district were made up of three-conductor, paper-insulated, lead-covered cable, terminated with three-conductor potheads. About that time the failure rate of this type of riser rose to serious magnitude and gave every indication of increasing. Almost all of the failures were on installations made up with modern paper cable and modern potheads. We decided to replace as quickly as possible almost 400 of these installations and

*Adapted from paper presented at recent E.E.I. engineering committee meetings at Chicago.

to use a different type of construction for all new work.

In an effort to determine what to use for replacement, we considered a very large number of different types of pole riser and terminal arrangements. We finally decided upon the use of single-conductor cables insulated with corona-resisting compounds and covered first with a well-saturated cotton braid and then with a lead sheath. When installing these cables we remove the lead sheath from the portion beyond the end of the fiber conduit at the top of the pole. After the lead is removed, the cable has the saturated braid protection which is normal for overhead installations. The braid-covered portions of the cables are carried under the crossarm in separate, small-diameter fiber ducts, then over the crossarm on pin insulators and down into porcelain cutout boxes.

Deciding considerations for this type of construction were:

1. It eliminates the need of potheads. Some people seem to have little or no trouble with potheads, but we were not so fortunate. We are satisfied that a number of different failure causes combined to give the high failure rate we experienced. Elimination of the pothead carried with it the incidental advantages of doing away with the need of solder at the top of the pole and made possible a much safer and neater pole top arrangement.

Advantages of Sheath

2. The use of the lead sheath over the corona-resisting compound has the following advantages:

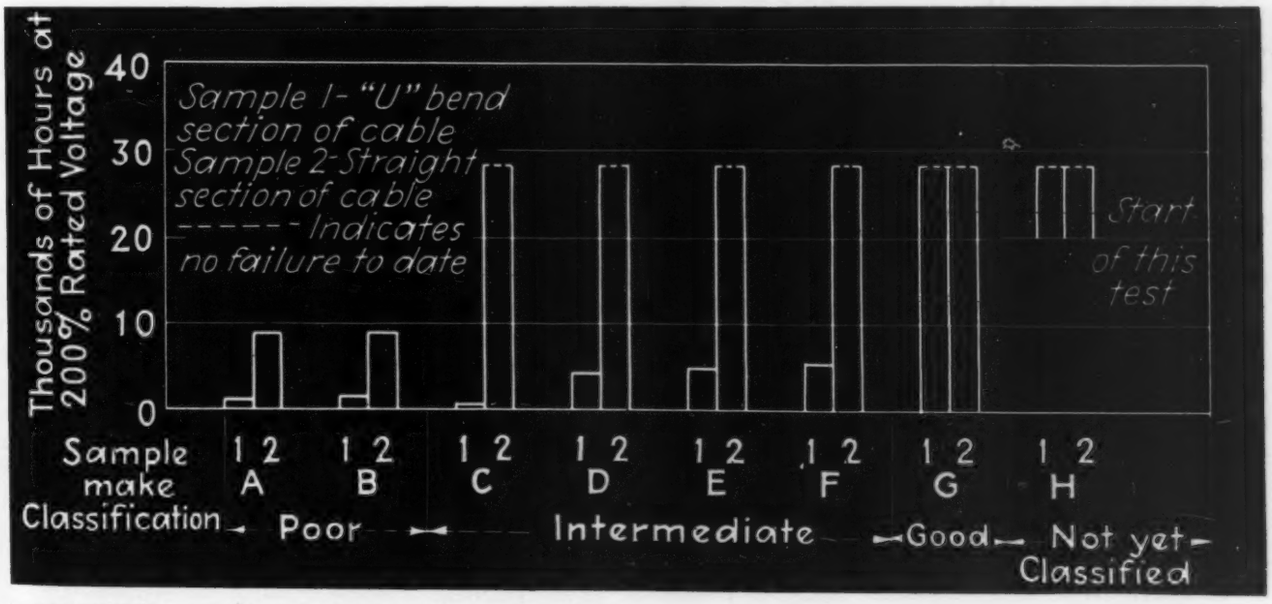
(a) It permits us to make a perfectly normal joint between the paper-insulated, lead-covered cable in the manhole and the pole riser cable. This was a very important consideration in our case, since a high percentage of the manholes in which these joints are located are flooded much of the time. We were just not able to convince ourselves that we could install hundreds of special joints between braid-covered cables and lead-covered cables and have these operate under water for twenty to thirty years without encountering a considerable amount of trouble.

(b) The lead sheath greatly improves the ability of the terminal cables to withstand lightning surges because it insures uniform electrostatic capacity to ground. Furthermore, the lightning arresters are connected directly between the conductor and the lead sheath which is grounded to the primary and secondary neutrals at the top of the pole. We feel that this entire arrangement represents the very best possible means for preventing damage from lightning.

(c) All danger of trouble from corona or capacity discharges is eliminated in that section of the cable under the lead. While the danger still exists in the sections between the end of the lead and the terminals, these are short, well separated and are at the top of the pole where it is convenient to guard against such trouble. We feel that the weakest part of this entire construction is at the point where the lead is terminated. Should trouble develop at this point in the future we feel that there is a real advantage in having this weak point at the top of the pole, where repairs can be made with a minimum of delay.

3. We decided to use the braid under the lead sheath because it leaves the insulation with perfectly normal overhead type protection after the lead sheath is removed from the section at the top of the pole. Incidentally, this braid offers a very real protection to the insulation during the operation of stripping off the lead sheath.

It has been said that the use of a cable with a metallic sheath of any kind introduces a serious safety hazard by making ground potential accessible at the top of the pole. How-



TESTS REVEAL acceptable corona-resistant compound cables

Sample 1 is a U-bend section of cable and sample 2 is a straight piece. All are being exposed to sunlight and double voltage. There have been no failures in the straight samples of makes C to H in more than 28,000 hours of test.

Only two of the "U" bend samples have not failed in this test. One of these two has been on test for the entire 3½ years. The test on the second type was started only about a year ago and the period is therefore too short to permit giving this compound comparable rating. It is interesting, however, to know that these two compounds were the only two given a "first class" rating in the other laboratory tests.

Of four compounds which have been on test for 3½ years the "U" bend samples have failed, but the straight samples are still under test. The laboratory, on the basis of the other tests, had stated that these compounds had some questionable qualities, but recommended installation of reasonable quantities for field experience.

The "U" bend and straight samples of two other compounds have both failed in the test. The previous laboratory tests showed that these two compounds did not warrant any field trials or further consideration of any kind.

Various quantities of cable insulated with all of the compounds except the two shown as "poor" have been placed in service in parts of the system where service continuity requirements are not as critical as they are in the distribution feeders. These field trial installations have not been in service long enough to produce any failure records that may be used to determine comparable quality. The performance will be carefully watched and the results tabulated as the years go by.

ever, the lead sheath leaves none of the uncertainty as to what potential may exist between the covering and ground as in the case of ungrounded non-metallic covers. This is particularly true when comparing the metallically shielded cable with cables covered with fibrous materials impregnated with semi-conducting compounds. Terminating the lead just below the top of the riser conduit makes this type of construction no more of a hazard than the use of ground wires under wooden molding.

Obviously, cable with both braid and lead sheath costs more than cable with braid only. Actually this difference in the cost of the cable results in only about 2 per cent increase in the complete cost of the pole riser, which includes the conduit and cable from the manhole to top of pole.

Many Troubles

Many other companies have decided to use pole riser cables insulated with corona-resisting compounds protected only with braid (no lead sheath). From ten companies using this type of construction we found that they have an aggregate of approximately 1,800 pole risers in service and some of these have been in operation as long as seventeen years. Most of the companies have experienced troubles from the following outstanding causes: (a) Mechanical damage; (b) lightning; (c) capacity discharge; (d) corona cutting.

Several of the companies have had trouble due to lightning. Installation of lightning arresters on the terminal poles is the only protection that can be provided in the case of braid-covered cables. If this type of protection proves inadequate, there remains no choice but to install cable with metallic shielding which will insure the maintenance of a uniform capacitance to ground and permit the connection of the arresters directly across the insulation that is being protected.

The number of cases of failure due to capacity discharge which were reported in the replies we received was not particularly high. Data given by some who have experienced trouble due to capacity discharge gave no indication that this type of trouble is more pronounced with different conductor sizes, different types of fibrous coverings, or that there is any correlation between the failures and the location in the conduits and other such factors. The following conclusions are advanced after many discussions on this subject with those who have studied it most thoroughly:

1. The danger of failure is eliminated by the use of a grounded metallic shield over each conductor.

2. No failures due to capacity discharge on riser cables in 2,300-volt delta-connected circuits or single-phase branch circuits operating at 2,300 volts to ground are known to the writer. This would explain why the twisting or cabling together of the conductors has apparently proved a satisfactory preventive for this type of trouble. Such cabling of the conductors insures intimate contact between phases where the voltage differential is in the order of 4,000 volts. There may still be considerable variation in the capacitance to ground, but the voltage differential in this case is at the lower level.

3. It is desirable to ventilate, in so far as it is possible, the conduit carrying the pole riser cables. If these conduits are sealed there is a tendency to trap the moist air and ozone and the resulting atmospheric conditions are very conducive to spark discharge.

4. Some feel that an asbestos braid effectively prevents damage from spark discharge. While there is insufficient evidence as yet to prove this thoroughly, there are some indications that it is correct. The damage caused by the spark discharge is largely due to thermal action and consequently any local carbonization of a cotton braid will certainly cause rapid acceleration of this thermal action, leading to ultimate failure. An asbestos braid will not carbonize and will therefore discourage such cumulative local action.

5. Much has been said about semi-conducting tapes and braids as a preventive for capacity discharge. These semi-conducting finishes present new problems in safety of operation and methods of installation, particularly in reference to joints and in regard to aging.

Comments on Corona Cutting

A number of failures were reported by other operating companies to be caused by corona and others as caused by exposure to sunlight. Prevention of this type of trouble is, in my opinion, almost entirely a case of using proper care in the selection of the type of insulating compound.

There has been a rapid growth of different types of "corona-resisting compounds" during the past ten years. The policy of our company has been to use on these important distribution pole risers only those insulating compounds that have proved themselves in actual service for a long period of time. A premium is being paid for these compounds, but here again the difference in cost between the cheapest corona-resistant compound and the most expensive would make only about 2 per cent reduction in the cost of the complete pole riser, including conduit and cable from manhole to pole top.

New Compounds Being Tested

We desire to give the manufacturers of newer types of corona-resistant compounds the opportunity to prove the merits of their new products.

All of the new corona-resistant compounds considered for use in our system are first put through a series of tests in our laboratories to determine the physical properties of the insulation, the dielectric strength, the ability to withstand corona and ozone and the moisture absorption.

The following tests, that may be considered in the general classification of accelerated aging tests, supplement those just named.

Two sample pieces of each type of compound are included in this special test. All outer coverings are removed from the samples and care is taken to see that no protective surface coating of any kind remains. One sample of each type is left straight, but the second sample is formed into a "U" bend with a radius well within the limits recommended by the cable manufacturer. All samples are then mounted on a grounded metal screen and placed on the roof of a building subject to all types of weathering. A voltage double the normal rating of the cable is then applied to all of the samples.

Tests of this type have now been in progress for about 3½ years and the results are shown in an accompanying illustration.

We feel that the method described gives all manufacturers the opportunity to develop new products of this type and watch their performance under operating conditions. At the same time it does not risk the introduction of new and untried products into the most important portions of our distribution system.

Selling a Rate Cut

Colorado company lays firm foundation for new understanding with its customers — Entire commercial staff and others visit each home to explain what a rate reduction means

WHEN RATES are cut it is usual to let customers know what has taken place. Space is taken in the usual media, notices may go out with bills, announcing that henceforward the customer will be getting more for less. It is like writing on the air.

However clever, however friendly, it may be, written notice of a rate reduction — especially in general media—remains a hard-boiled statement of fact. It is not apt to make the customer feel much closer to the company or to diminish the intensity of such grievances as may be on his mind. Tomorrow the paper is gone, the exact statement is a hazy memory, and in a few days the whole event is, to the customer, a thing of the past.

When the Public Service Company of Colorado cut its rates last year it engaged the usual media, told its story in the usual way. But that was merely groundwork for its big plan—to let its customers know that this $1,051,000 saving was an important, personal affair; to make the rate reduction the starting point for a new understanding between those who render the service and those who pay the bills.

Problem of Telling

There were 100,000 affected commercial and domestic customers in the Denver area. The task that Public Service set out for itself was to have a friendly, personal talk with each of these customers within 90 days after the rates were cut.

Public Service did not want its customers to forget. Furthermore, it wanted them to know just what the savings would mean, and hoped thereby to produce an atmosphere of good feeling which would lead customers to unburden themselves of grievances

and thus give the company an opportunity to correct the cause, at least in those cases where the cause was within the bounds of reason.

A twenty-minute call on each of 100,000 customers represents a lot of man-hours. In addition, Public Service wanted each call made by a person able to discuss all phases of the customer's relations with the company. Hence the initial problem was one of personnel.

Employees of the commercial department were a logical first choice, and the entire commercial staff was withdrawn from regular duty, making up 120 of the 200 persons who were needed for the job. The 80 others were picked from operating and accounting personnel.

The 200 were divided into four divisions with a sub-executive in charge of each, and each division was further divided into half a dozen smaller groups. In these latter, small units, the canvassers were intensively trained on ways to approach the customer and conduct the interview.

Premise of the campaign was that quick interviews were out, and interviews were not to be conducted at all until the canvasser was inside the door. These steps were considered essential to an easy, get-acquainted atmosphere on which good relations might be built.

Having entered the home and explained his purpose, the company representative tried to explain the rate reduction in four ways. These were in terms of: (1) The savings in dollars, (2) the per cent saving, (3) the equivalent of the saving in months of free service, (4) the amount of extra usage which the saving would permit.

For these purposes he carried a card on which was noted the customer's monthly bills and usages for the preceding twelve months. However, the data thereon were not interpreted to the *n*th degree in advance. Such a procedure would have robbed the interview of much of its personal touch. Instead, figuring out exactly what the savings would be took place during the call. The canvasser was able to say, "Now let's just see how many dollars and cents you'll be saving this year." And he and the customer would figure it out together.

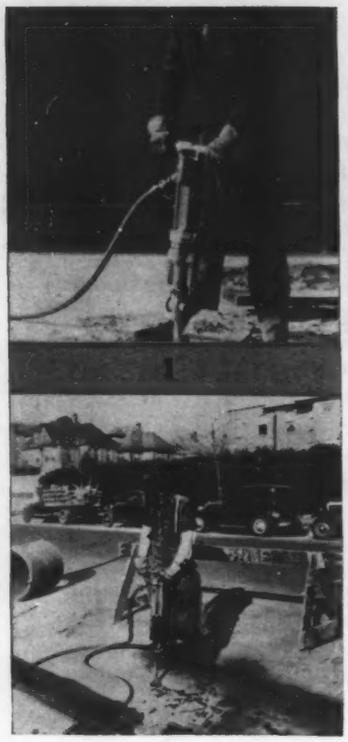
Ignorant of Rates

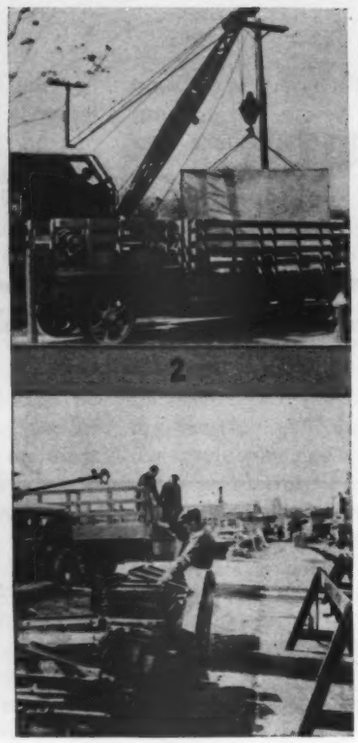
Some hazy notions about bills were anticipated. But canvassers were unprepared for the extent to which customers evidenced complete misconceptions both as to meanings and amounts. Many were astounded at the amount of electricity they could get for just a few cents.

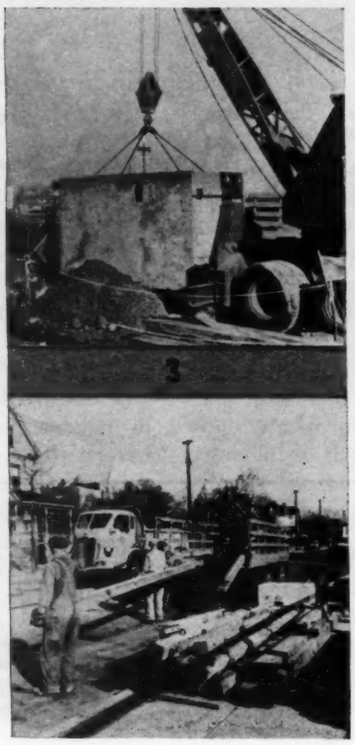
This explanation of bill and savings was the starting point of a general discussion of the company and the service. In addition, the company needed information about the customer—such as size of family, number and kind of appliances in use. But the canvasser put no direct questions, nor did he work with a notebook in his hand.

The interview was leisurely, and he used an indirect, conversational approach. As the interview went on and the customer began to realize

[*Continued on page 49*]







Precast Manholes vs Fi

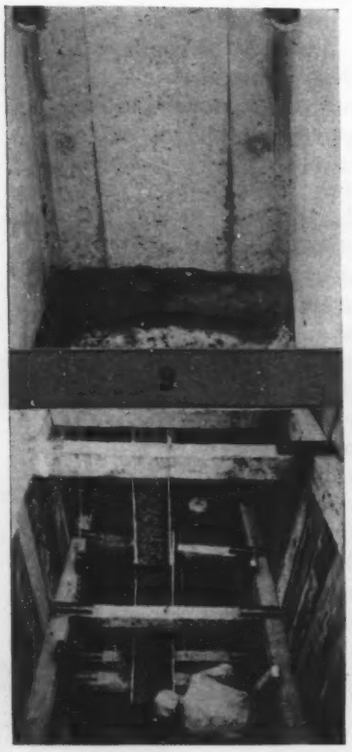
*ERNEST WILLIAMS.** Consolidate

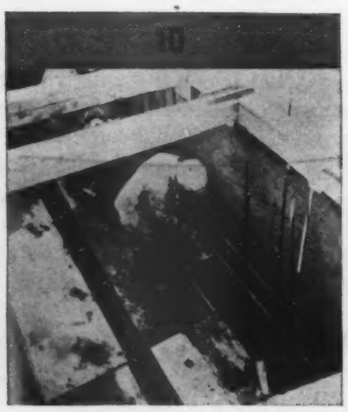
THE CAISSON method of installing manholes developed by the Consolidated Edison System has been in use since August, 1938. One hundred and sixty-five caisson manholes ranging in size from 7 ft. x 3 ft. 6 in. x 5 ft. to 11 ft. x 4 ft. 2 in. x 6 ft. 6 in. have been installed to date, and this method of construction is now standard in the Consolidated Edison Company of New York, Inc., except in locations where there is great congestion of subsurface structures.

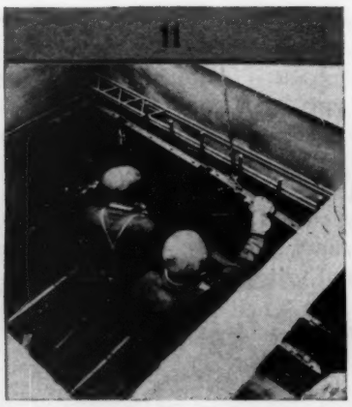
The basic advantages of the caisson method over the poured in the field method formerly used are:

1. Placing of the steel reinforcement, assembling of the forms and pouring of the concrete are transferred from the field to the construction yard, where they can be performed by closely controlled mechanized methods.

*Adapted from paper at E.E.I. transmission and distribution committee meeting, St. Louis, February 5, 1940.



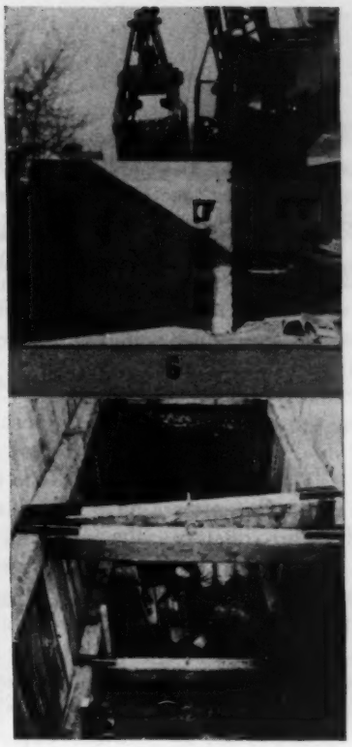


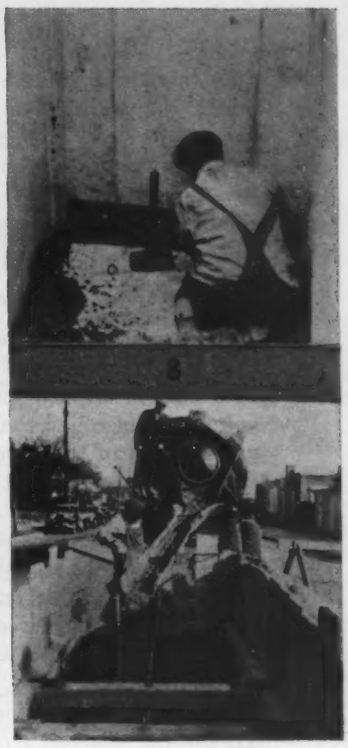


CAISSON METHOD of setting precast manholes takes eight hours; conventional installation of poured manholes takes five days

Caisson Method—(1) Pavement is broken; (2) manhole unloaded; (3) set in place; (4) bucket excavates from inside; (5) corners dug out by hand at intervals; (6) the caisson sinks; (7) precast floor lowered; (8) floor bolted in place; (9) floor grouted; (15) transformer installed; (16) cover slabs, frame and grating set and pavement restored.

Conventional Method—(1) Pavement broken; (2 and 3) forms and shoring unloaded; (4, 5 and 6) excavating and shoring proceed; (7, 8 and 9) floor reinforcement placed and floor poured; (10) wall reinforcement placed; (11) forms installed; (12) walls poured; (13) construction interrupted for two days while concrete cures; (14) transformer installed; (15) shoring removed; (16) cover slabs, frame and grating set in place and pavement restored.





Field Construction

Edison Company of New York, Inc.

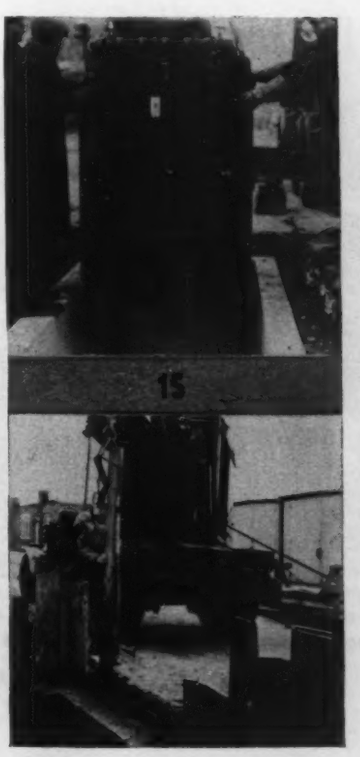
2. Use of temporary shoring in the field is eliminated, since the caisson manhole walls serve as an integral shoring assembly. This is conducive to safety.

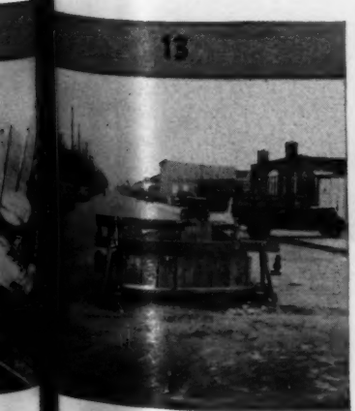
3. Hindrance to street traffic is materially reduced, since several field operations are eliminated and there is no waiting for the concrete to cure. A transformer manhole can be constructed by this method and the transformer installed in one eight-hour day.

In the accompanying series of illustrations the "caisson" operations are placed above the corresponding conventional operations; pictures missing indicate that certain operations have been eliminated.

In selecting the exact site of the manhole, all available subsurface structure records are examined so that the location chosen will be free of pipes, underground ducts or obstructions. As an additional precaution, previous to the actual construction, a survey of the area is made to locate metallic pipes, such as gas, water, steam mains and services, using the "M-Scope." The use of this device by various companies in locating underground metallic structures has been fully described in previous publications.

After the pavement has been broken and removed the caisson is set in place and all excavating is done from inside of the caisson walls. The earth is removed by the clamshell bucket within the caisson, as illustrated, and at intervals two men with pneumatic shovels are sent into the man-





hole to remove the earth remaining under the walls, thus causing the caisson to sink. This process is repeated from three to six times until the walls have been lowered to the required depth. The sinking of the caisson takes one to 1½ hours.

Leveled and Tamped

The base for the floor is then leveled and tamped and the precast floor slab is lowered into place and bolted to the walls, thus making an integral unit of the manhole. Wherever required a precast sump pit is fitted into an opening in the floor, after which grout is poured into the joints between the sump and the floor as well as the floor and the walls. The bolts and angle iron joining the walls and floor are then covered with mortar.

If the manhole being built is a transformer manhole the transformer unit is installed immediately, since the floor and walls are now rigidly joined and there is no need of waiting for the grout to harden. The manhole roof is also of precast concrete construction. The openings around the caisson walls are finally backfilled and tamped and the street pavement restored.

With the exception of restoring the top pavement, the entire field operation, including the placing of the transformer, is easily completed in one eight-hour day, whereas to build a transformer manhole by the superseded method normally required five days (if temperatures are not too low to pour concrete in the field) because of the additional operations involved and the time lost while the concrete cures. For example, after the floor is poured approximately two hours must be allowed for the concrete to set before the wall forms can be installed, and after the walls are poured two days must be allowed before the forms can be struck and the transformers placed.

The mobile crane which is used in this work is rated at 16½ tons and is equipped with an air compressor which is used for supplying pavement breakers, pneumatic shovels, wrenches and other pneumatic equipment. A speed up to 35 miles per hour is available to cover the large territory in which manholes are installed by this company. The clamshell excavator is of ⅜-cu.yd. capacity and is sufficiently small to enable it to pass easily inside the walls of the smallest manholes used by the Consolidated Edison System. The crane in use is shown below.

Method Practical and Economical

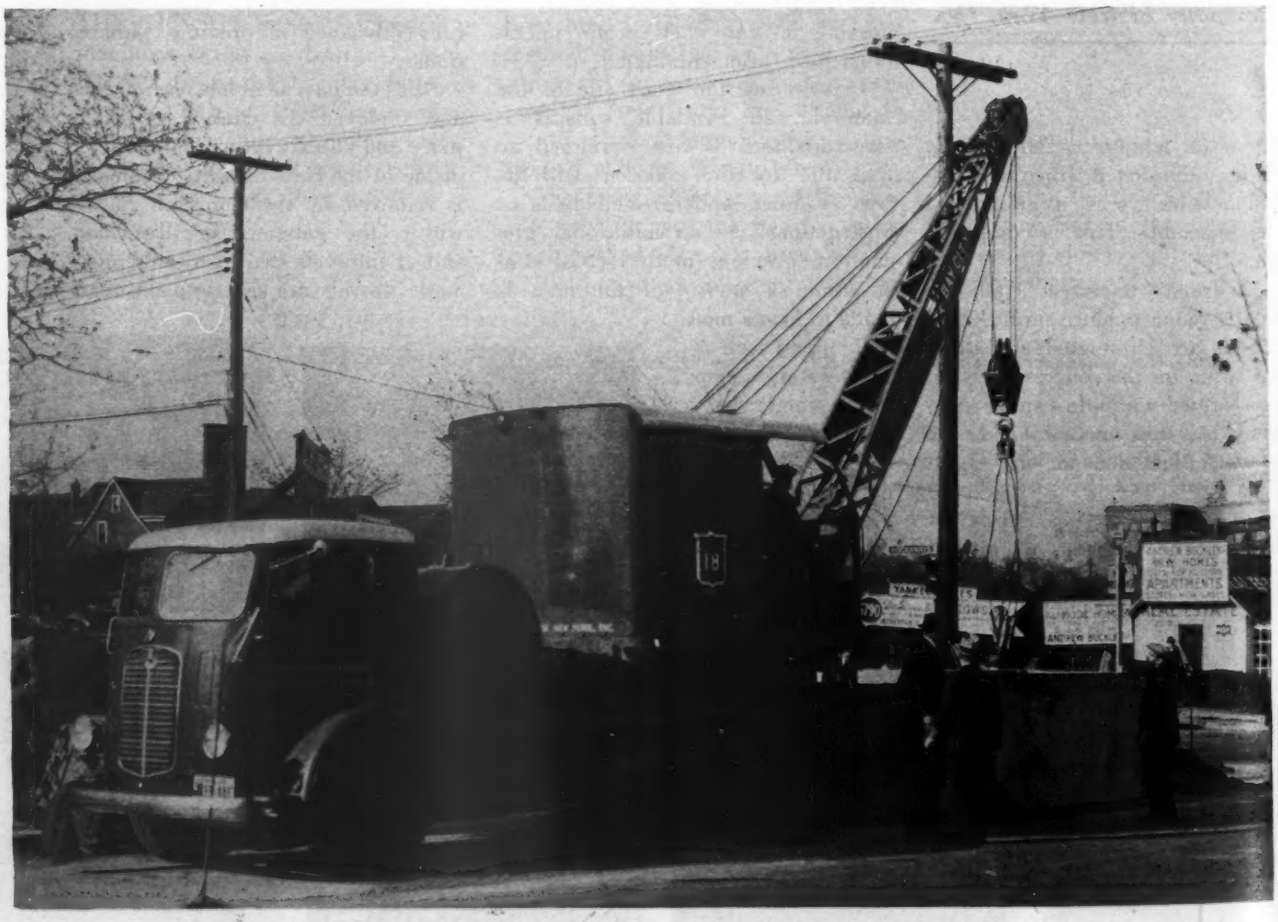
As the result of our experience over a period of sixteen months, during which 165 caisson type manholes have been installed, we have reached the following conclusions:

1. The caisson method of construction is practical.

2. Economies of the order of 20 to 35 per cent have been achieved by using the new method. These economies are expected to increase as further experience is gained.

3. The caisson method of construction is conducive to safety.

4. The hindrance to traffic during construction has been greatly reduced.



AUTOMOTIVE EQUIPMENT comprises crane, clamshell bucket, air compressor and air-operated pavement and excavating tools. It can move 35 miles per hour to jobs

Protection and Operation of Rural Lines in Southeast

Better lightning protection and less expensive circuit interruption needed — Radio noise controlled by proper installation of clamps and hardware — Co-ordination of protective equipment still not easy to attain

L. C. FLOURNOY,* Superintendent of Distribution, Alabama Power Company, Birmingham

EXPERIENCE in operation of extensive rural line mileage added to the recommendations of others having corresponding coverage in the Southeast leads to the following major conclusions:

(1) Rural line customers should know what to expect from the utility. (2) There is an opportunity for material savings through careful organization of meter reading and collecting routine. (3) Securing proper clearance from trees is a serious problem—dead and diseased danger trees should be removed. (4) Co-ordination of protective equipment is essential to satisfactory operation, but is difficult to secure with present equipment. (5) Better lightning protection for meters and customers' equipment on a practical cost basis is needed. (6) A satisfactory oil circuit breaker for rural substations at a reasonable cost is needed. (7) Careful studies to co-ordinate and reduce operating and maintenance costs will pay good dividends. (8) Careful selection and proper installation of clamps and hardware are essential in preventing radio interference. (9) Heavy maintenance on well-designed and well-constructed lines is still a problem of the future.

A Big Problem

Also, there are two kinds of rural lines—those built at the lowest possible cost to meet a social and political situation and those built at a higher cost to do this, but also with a view to rendering good and adequate service and paying their way, or even making a profit. If the former, it is sufficient to study the problems of operation and maintenance with a view to keeping the costs to a minimum—sort of making the best of a necessary evil. If the second variety, the problem is much more complicated and is combined with another just as big—building the rural line load to the point where the service will become a necessity and a possible source of profit.

Left to himself, the rural customer tends to be a minimum bill customer —using electricity for a few lights and the radio—and this tendency must be overcome. This job cannot be left entirely to the sales department if we have any regard for cost, but affords a fine opportunity for guiding and bending operating and maintenance functions so that they co-operate with and reinforce sales efforts. If this is done, it is not too much to expect that rural lines which have been wisely built may become a source of satisfaction to the customers and a mutually profitable venture for both customers and company.

What are the operating troubles?

1. Outages from oil circuit breaker operations and fuses blowing.
2. Tree contacts and falling trees.
3. Lightning damage to poles and insulators.
4. Equipment and equipment failures.
5. Radio interference.
6. Lack of co-ordination studies and other studies related to rendering good service.

Most companies are having too many outages from the clearing out of repeater type fuses and pole type oil circuit breakers in cases where no permanent trouble is located. The solution probably lies along the following lines:

(a) Additional or improved lightning protection.

(b) Better application of equipment.

(c) Equipment having a wider range for co-ordination.

Requires New Investment

The solution will call for additional investment in equipment to reduce operating expenses.

(a) At what intervals should lightning protection be installed or is protection at transformer installations only sufficient? The number of protection points, of course, will increase as new customers are served from existing lines.

(b) What is the exposure limit in miles of single-phase circuit for good service when protected by a pole-top oil switch of the instantaneous reclosing type? Is it 40 miles, 60 miles, 80 miles or 100 miles?

What should be the exposure limit for a repeater type fuse? Ten miles, 15 miles or 25 miles?

I do not have the answers to these questions, but am of the firm belief that in many cases circuits are being extended too far for the types of protective equipment used.

There is, in my opinion, a definite field for a small reclosing oil circuit breaker with time-delay characteristics and variable-tripping values.

*Adaptation of paper presented at recent meeting of Southeastern Electric Exchange.

The ideas as to what should be used to protect rural circuits at substations vary widely. Some seem to think that a high-capacity oil circuit breaker fully equipped with relays is required; others, that instantaneous reclosing pole-top breakers will give satisfactory service, and in some cases only repeater fuses are used at substations supplying several hundred miles of lines. The investment required is probably the determining factor in two of the cases just mentioned. In the first case the investment required is on the order of $2,500.

I feel certain that there is a market for a reclosing oil circuit breaker with rupturing capacity suitable for 300- to 450-kva. substations, if such a breaker can be purchased complete for less than $1,000.

Lightning Damage

Lightning protection on rural lines is more difficult than in cities due to soil conditions, lack of underground piping systems and lack of shielding by buildings.

Experience has shown that the destruction of poles by lightning may be reduced to a minimum through grounding, but the grounding of poles and pole cap pins on rural lines increases the number of flashovers during storms and imposes a more severe burden on other equipment. Experience of one company indicates that a 2-in. gap in the ground wire over 4 in. of pole will reduce the number of flashovers and still protect the pole from damage by lightning.

There should be relatively little trouble from insulator failures on 6,900-volt rural lines. There have, however, been some mighty mean cases of trouble from insulators on steel pins puncturing to the pins. This indicates a manufacturing defect in the insulators, as insulators correctly manufactured should flash over without puncturing. These statements refer to 17-kv. insulators with 40-kv. wet and 70-kv. dry flashover value.

During the past five or six years manufacturers have offered numerous types of transformers and protective equipment combinations for rural lines. Some of these were manufactured under pressure in an effort to reduce the first costs on rural lines. Most operating men will probably agree that the so-called "rural type transformer" with a simple gap for high side protection does not give sufficiently satisfactory service if the rural line is supposed to render good service.

There is not as yet a completely self-protecting transformer, or any combination of transformer and protective equipment, that is all that can be desired; however, in many cases a material improvement in service has been effected by substituting the CSP type for the conventional type transformer.

One company's experience with type CSP transformers during the year 1938 is as follows:

Number of CSP transformers in service 10 kva. and smaller	7,509
Capacity of CSP transformers, 10 kva. and smaller (kva.)	31,052
Total removals on account of unsatisfactory operation, number	109
Total removals on account of unsatisfactory operation, kva. capacity	442.5
Capacity removed, expressed as percentage of capacity in service (%)	1.425
Type CSP transformer winding failures, number	46
Type CSP transformer winding failures, kva. capacity	233
Winding failures in per cent of capacity in service (%)	0.75

Meters and Lightning

Recent investigations indicate that there is no cause for alarm, so far, over inaccuracy of rural line meters due to the effect of lightning discharges on the permanent magnets and that recent improvements in magnets will more than take care of any adverse effects.

Meter failures from lightning on rural lines have caused considerable expense due to their remote locations. One company's meter failures on rural lines due to lightning since 1938 approximated 3 per cent of the total meters on rural lines. The ratio of failures of outdoor type detachable meters to the conventional type indoor meter was ten to one. The majority of these failures were in areas where low ground resistances were impractical from the standpoint of cost.

It would seem that providing a spill-over gap of some kind at a location where the high secondary potentials from induction and/or protective equipment discharges could be shunted around the meter and the customer's equipment might provide a solution. At any rate one company is experimenting along these lines in an effort to reach a solution. No results of this experiment are available yet.

Much time is often required to locate the cause of radio interference and make corrections. Satisfactory results can usually be secured with a good automobile radio with rectifier type mil-ammeter inserted in the speaker circuit. The ammeter scale should be approximately 5 milamperes. Watching the ammeter indicator will be more effective in directing you to the cause of the interference than listening to the noise.

On lines insulated for 17 kv. the most frequent cause of radio interference is something loose. Loose clamps, tie wires, hardware or connections are the worst offenders.

Seventeen-kv. insulators on 6.9-kv. lines seldom cause radio interference. Therefore, changing insulators should be a last resort.

The best preventive of radio interference on rural lines is the careful selection of clamps of all kinds, the use of locking devices on all nuts and good workmanship.

Meter Reading, Billing, Collecting

Expenses involved in meter reading, billing and collecting on rural lines are much greater per customer served than are corresponding urban costs.

Some suggestions to reduce this expense have been offered as follows: Prepay or coin type meters, furnishing the customer postal cards and requesting that they send in the meter readings, quarterly billing, and rendering bills as meters are read. In my opinion the suggestion that bills be rendered as meters are read has possibilities without serious disadvantages; however, this plan requires a relatively simple rate structure and handling by intelligent employees.

A meter reader on rural routes can, and should be, an entirely different type of employee from that used in the larger towns where all classes of employees are readily available. A properly selected employee for rural meter reading and collection work could turn in valuable reports regarding hazardous tree conditions, the condition or position of repeater fuses, and other conditions which should be corrected.

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CORRECTION—E. J. Allen is a General Electric, not a Westinghouse, engineer, as was erroneously stated in the report of discussion of the A.I.E.E. convention "Lightning Protection" session on page 52, ELECTRICAL WORLD, February 10, 1940.

Commercial and Industrial Data Sheets for Northwest

The power sales committee launches a contest to create data sheets on commercial and industrial electric heating applications — Member companies co-operate on a subscription basis

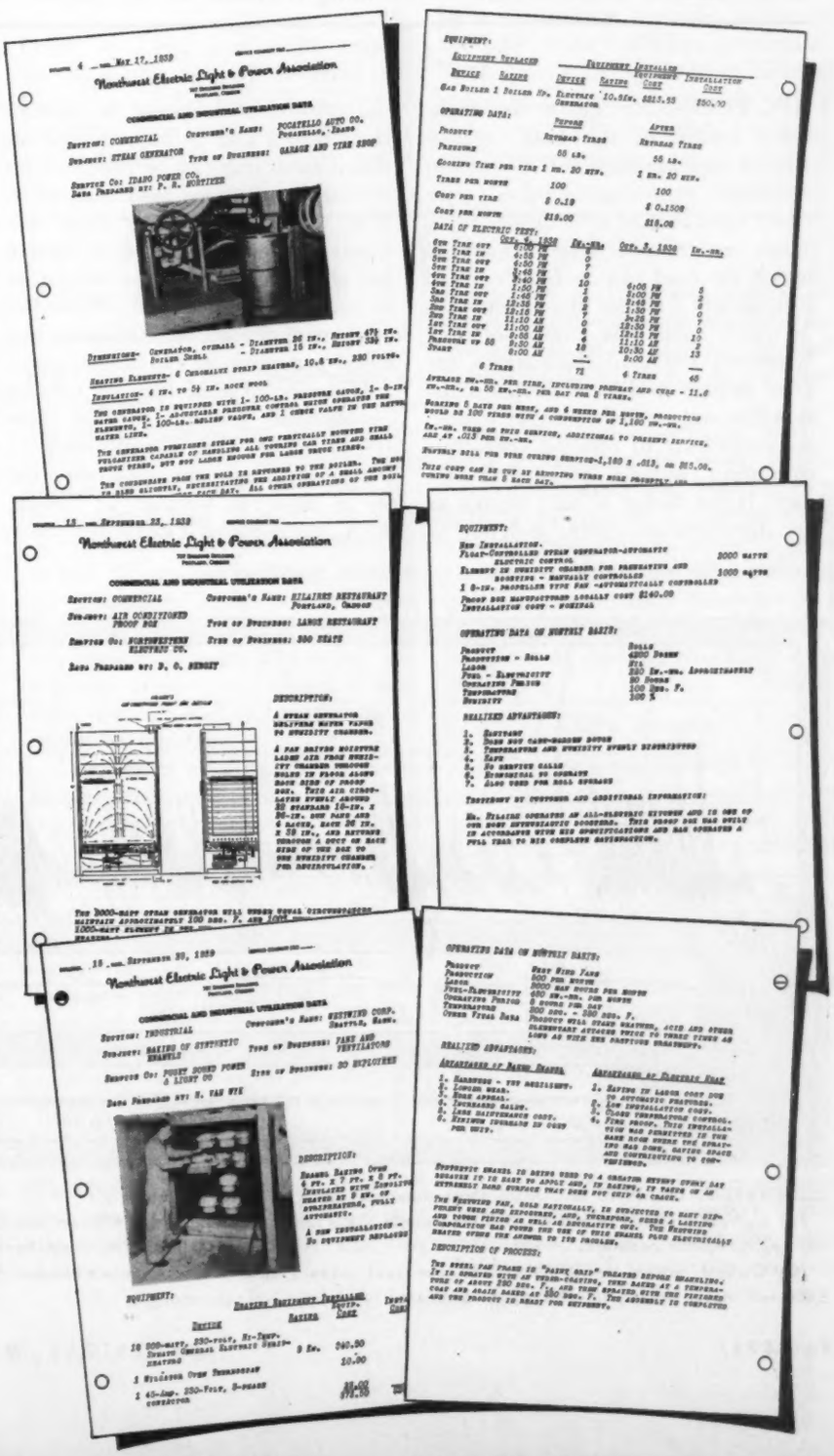
A NEW SALES TOOL for commercial and industrial power salesmen of public utility companies in the Pacific Northwest has been provided through the Northwest Electric Light and Power Association in the form of "data sheets" describing unusual electric heating applications in the territory.

Fifteen data sheets, based upon facts supplied by power salesmen, were issued by the association during 1939, the cost of the service being underwritten by company subscriptions of a quantity sufficient to provide copies of the series for each power salesman and for each district office.

The sheets are for utility sales use rather than, as is perhaps customary, for distribution to customers or prospects. As a result, the format of the data sheets, which are produced by the photo-lith process, is uniform as to heading and arrangement of material and the material itself is presented in boiled-down, tabular form.

As these data sheets are working tools, condensation to minimum practicable space has been sought, so that in practically all cases the material has been held down to both sides of a single sheet. Punched for standard three-ring folders, the sheets fit into salesmen's manuals and folders alongside catalog material, engineering data and other sales aids.

[*Continued on page 100*]


Northwest Electric Light & Power Association

COMMERCIAL AND INDUSTRIAL UTILIZATION DATA

Section: COMMERCIAL — Customer's Name: POCATELLO AUTO CO., POCATELLO, IDAHO

Sub-sect: STEAM GENERATOR — Type of Business: GARAGE AND TIRE SHOP

Service Co: IDAHO POWER CO.
Data Prepared by: P. R. HORTIVEN

Dimensions- Generator, overall - Diameter 26 in., Height 47½ in. - Diameter 16 in., Height 33½ in.

Heating Elements- 6 Calorealite sheath heaters, 10.6 kw., 230 volts.

Insulation- 4 in. to 5½ in. rock wool

The generator is equipped with 1- 100-lb. pressure gauge, 1- 0-in. water gauge, 1- adjustable pressure control water operates the elements, 1- 300-lb. safety valve, and 1 combe valve in the return water line.

The generator furnishes steam for one vertically mounted tire vulcanizer, capable of handling all tooling for tires and small truck tires, but not large enough for large truck tires.

The condensate from the mold is returned to the boiler. The generator is also electric, discontinuing the addition of a small amount of [illegible] each day. All other operations of the boiler are manual.

Equipment:

Equipment Replaced			Equipment Installed			
Device	Rating	Device	Rating	Cost	Cost
Gas Boiler	1 Boiler Hp.	Electric Generator	10.5 Kw.	$215.55	$50.00

Operating Data:

Product	Before Retread Tires	After Retread Tires
Pressure	55 lb.	55 lb.
Cooking Time per tire	1 hr. 20 min.	1 hr. 20 min.
Tires per hour	100	100
Cost per tire	$ 0.19	$ 0.1500
Cost per hour	$19.00	$15.00

Data of Electric Test:

	Oct. 30, 1938	Kw.-hr.	Oct. 3, 1938	Kw.-hr.
Gen Tire out	6:00 PM			
Gen Tire in	6:55 PM	0		
Gen Tire out	6:50 PM	7		
Gen Tire in	7:45 PM	7		
Gen Tire out	8:40 PM	0		
Gen Tire in	9:40 PM	10		
Gen Tire out	1:00 PM	1	4:00 PM	5
Gen Tire in	1:45 PM	6	4:00 PM	2
Gen Tire out	12:35 PM	2	2:45 PM	6
Gen Tire in	12:15 PM	2	1:30 PM	0
Gen Tire out	11:10 AM	7	2:25 PM	7
Gen Tire in	11:00 AM	0	12:30 PM	0
Gen Tire out	9:50 AM	6	12:15 PM	10
Pressure to 55	9:30 AM	4	11:10 AM	2
Start	9:00 AM	18	10:30 AM	13
			8:00 AM	
	6 Tires	72	6 Tires	45

Average kw.-hr. per tire, including preheat and cure - 11.6 kw.-hr., or 58 kw.-hr. per day for 5 tires.

Working 8 days per week, and 6 hours per day, production would be 100 tires with a consumption of 1,160 kw.-hr.

Kw.-hr. used on this service, additional to present service, add at .015 per kw.-hr.

Monthly bill for tire curing service-1,160 x .015, or $15.00.

This cost can be cut by keeping tires hot promptly and curing more than 6 each day.

Equipment:

New Installation.
Float-Controlled steam generator-automatic electric control — 2000 watts
Element in humidity chamber for preheating and boosting - manually controlled — 1000 watts
1 8-in. propeller type fan -automatically controlled
Proof box manufactured locally cost $140.00
Installation cost - nominal

Operating Data on Monthly Basis:

Product	Rolls
Production - Rolls	4200 Dozen
Labor	84
Fuel - Electricity	2520 kw.-hrs. Approximately
Operating Period	80 Hours
Temperature	100 Deg. F.
Humidity	100 %

Realized Advantages:

1. Economy
2. Does not cake-harden dough
3. Temperature and humidity evenly distributed
4. Safe
5. No service calls
6. Economical to operate
7. Also used for roll retards

Statement by customer and additional information:

Mr. Stalite operates an all-electric kitchen and is one of our most enthusiastic boosters. This proof box has built in accordance with his specifications and has operated a full year to his complete satisfaction.

Northwest Electric Light & Power Association

COMMERCIAL AND INDUSTRIAL UTILIZATION DATA

Section: COMMERCIAL — Customer's Name: SILVERS RESTAURANT, PORTLAND, OREGON

Sub-sect: AIR CONDITIONED PROOF BOX — Type of Business: LARGE RESTAURANT

Service Co: NORTHWESTERN ELECTRIC CO. — Size of Business: 300 SEATS

Data Prepared by: D. C. BENNET

Description:

A steam generator delivers moist vapor to humidity chamber.

A fan driven moisture laden air from humidity chamber through holes in floor above back side of proof box. This air circulates evenly around 32 standard 14-in. x 26-in. bun pans and 6 racks, each 26 in. x 39 in., and returns through a duct on back side of the box to the humidity chamber for recirculation.

The 2000-watt steam generator will hourly steam circumstances maintain approximately 100 deg. F. and 100% [illegible]

Northwest Electric Light & Power Association

COMMERCIAL AND INDUSTRIAL UTILIZATION DATA

Section: INDUSTRIAL — Customer's Name: WESTWIND CORP., SEATTLE, WASH.

Sub-sect: BAKING OF SYNTHETIC BRAKELS — Type of Business: FANS AND VENTILATORS

Service Co: PUGET SOUND POWER & LIGHT CO. — Size of Business: 30 EMPLOYEES

Data Prepared by: H. VAN WYK

Description:

Brakes Baking Oven 4 ft. x 7 ft. x 8 ft. Insulated with Insulite Insulated by 9 kw. of strip heaters, fully automatic.

A fine installation - No equipment replaced

Equipment:

Heaters Replaced			Equipment Installed		
Device	Rating	Rating	Cost	
10 800-watt, 230-volt, Hi-Temp. Sheath Chromel Electric Strip-Heating	8 Kw.	240.00	
1 Stillson Oven Thermostat		10.00	
1 45-Amp. 230-Volt, 3-phase contactor		10.00	
		260.00	

Operating Data on Monthly Basis:

Product	Vent Wing Fans
Production	500 per month
Labor	2000 BAF Round per month
Fuel-Electricity	480 kw.-hr. per month
Operating Period	8 hours per day
Temperature	200 deg. - 280 deg. F.
Other Vital Data	Product will stand weather, acid and other elementary attacks twice to three times as long as with the ordinary treatment.

Realized Advantages:

Advantages of Paint Shapes	Advantages of Plastics Heat
1. Handsome - the brilliants. 2. Longer wear. 3. Real appeal. 4. Increased sales. 5. Less maintenance cost. 6. Minimum increase in cost per unit.	1. Saving in labor cost due to automatic features. 2. Low installation cost. 3. Close temperature control. 4. Time proof. This installation was permitted in the same room where the spraying was done, dusting space and contributing to comfortable.

Synthetic shakes to bring used to a greater extent every day because it is easy to apply and, in baking, it takes on an extremely hard surface that does not chip or crack.

The Westwind fan, sold nationally, is subjected to many different uses and exposures, and, therefore, needs a lasting compounding has proved the use of this brand. The Electric heated ovens the answer to the problem.

Description of Process:

The steel fan frame is "paint coat" treated before shearling. It is heated with an enamel-coating, then baked at a temperature of about 280 deg. F., and then sprayed with the finished and again baked at 280 deg. F. The assembly is complete and the product is ready for shipment.

TYPICAL DATA SHEETS in series inaugurated by Northwestern Electric Light and Power Association. Basic data furnished by power salesmen describes (1) customer operations and scope; (2) data on electrical units, cost installed, demand and consumption. Sheet includes list of realized advantages and customer testimonial.

Serving Arc Furnace Loads in Suburban Areas

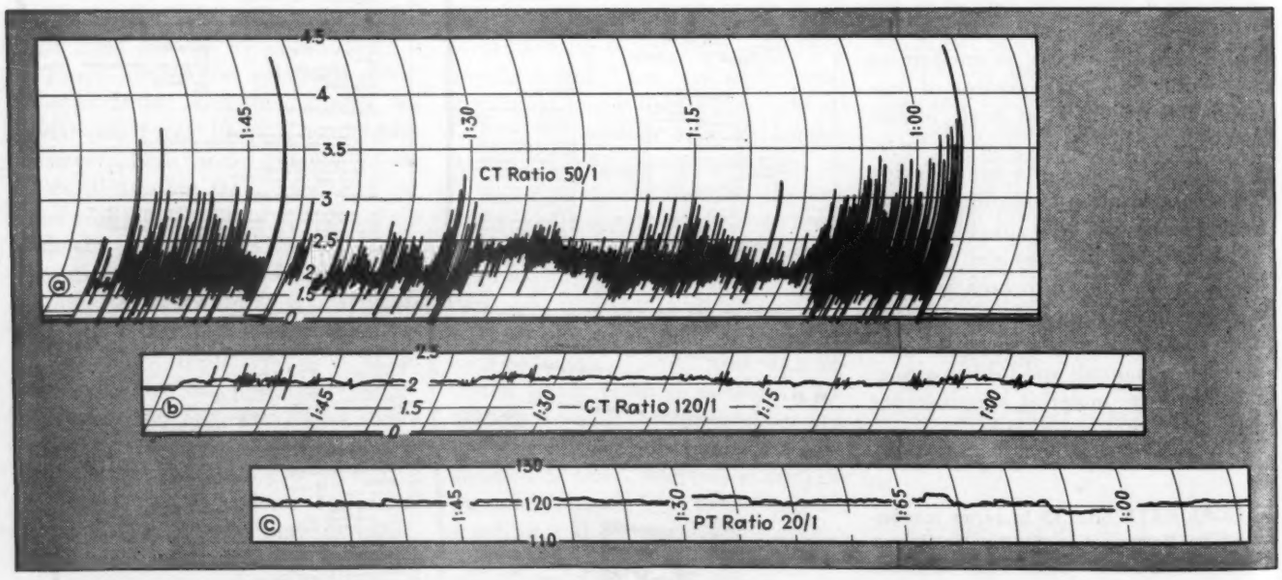
Two single-phase arc furnace installations in a suburb of Detroit provide opportunity for comparing the virtues of synchronous condenser and motor-generator set for correcting voltage disturbance due to load fluctuation

L. W. CLARK, Electrical System Planning Division, Detroit Edison Company

ARC FURNACES, due to the fluctuating nature of the load, require special consideration by the power company supplying service, especially when located in suburban areas. There are always several ways in which the load can be handled, and it is usually a matter of economics as to which method is finally selected. Whenever the load fluctuations are great enough to disturb the transmission line voltage and cause lamp flickers some form of rotating corrective equipment usually becomes necessary. If the flicker is only visible in the distribution system, and not in the transmission system, a separate transformer and perhaps a separate distribution line can be provided for serving the furnace load separately. This will usually prove more economical than the required investment for either a synchronous condenser or motor-generator set. When all other methods prove inadequate the motor-generator set can be employed.

However, of some fifty arc furnace installations, ranging in size from 100 to 10,000 kva. in and about the Detroit area, only one installation far out in suburban territory at Vassar, Mich., has required a motor-generator set. This furnace, while relatively small in size, is so far removed from any large concentrations of generating capacity of the bulk transmission system that a motor-generator set is a necessity.

At this location there are two single-phase arc furnaces (accompanying diagram illustrating both the motor-generator set and synchronous condenser method of solution). The smaller furnace, rated 250 kw., 360 kva., has maximum instantaneous load fluctuations of about 500 kva. and was served from the 4,800-volt synchronous condenser bus. Calcu-



CONCURRENT GRAPHIC RECORDS show damping effect of motor-generator set

(a) Current supplied to 600-kw., 875 kva., single-phase furnace by 600-kw., 4,800-volt generator of m.g. set.

(b) Current drawn by 1,750-kva., 80 per cent power factor, 2,400-volt motor driving furnace supply generator.

(c) 2,400-volt substation bus voltage from which m.g. set is supplied. The slight fluctuations to be noted are not visible as lamp flicker enters because the changes are too slow or they are not large enough.

lated voltage fluctuations on the 4,800-volt bus due to the furnace operation are 4.8 per cent with the condenser shut down and 3.2 per cent with the condenser operating. This is a standard design of synchronous condenser with a sub-transient reactance of 24 per cent and a synchronous reactance of 164 per cent.

As long as there was no general lighting load served from this bus the voltage conditions were satisfactory, as the flicker in the main 24-kv. bus was not objectionable under normal operating conditions with both 24-kv. lines in service. However, it later became necessary to transfer lighting load to the 4,800-volt bus, and then, even with the condenser in operation, the flicker proved annoying and caused the furnace load to be transferred to the motor-generator set on the other bus.

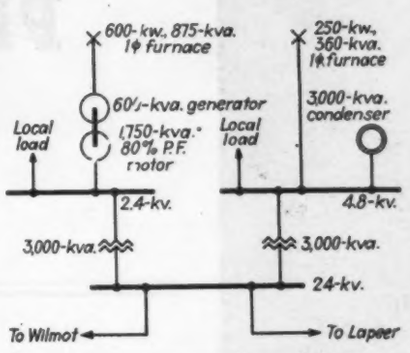
Too Much Flicker

The motor-generator set, consisting of a 1,750-kva., 80 per cent power factor synchronous motor driving a 600-kw. generator, was originally installed to handle a 600-kw., 875-kva., single-phase furnace which has maximum load fluctuations of about 1,300 kva., or 2½ times those of the smaller furnace, and would cause a flicker of about 12.5 per cent on the bus if corrective measures were not applied. Even if a separate transformer, served direct from the 24-kv. transmission system, were employed the flicker on the 24-kv. bus would amount to 8 per cent, which is far in excess of accepted standards of flicker control.

It is obvious that a condenser installation of sufficient size to reduce the 12.5 per cent flicker to something in the order of 1.5 per cent to 2 per cent would not only be expensive but it would also be of much greater size than could ever be used or needed for general voltage control of that portion of the transmission system. However, the motor-generator set, which has a slightly lower installed cost than the 3,000-kva. condenser on the opposite bus, does reduce the flicker to less than 2 per cent and tests show the set to be at least five times as effective in flicker reduction as the more costly 3,000-kva. condenser.

Load and voltage charts are shown for the motor-generator set with the large furnace in operation. The generator single-phase load current shows maximum swings in the order of 1,000 kva. (200 amp.). Oscillographic tests of the same size furnace at another installation showed maximum swings of 1,300 kva. The motor input current for the same period of operation holds fairly constant at about 240 amp., three phase, which is about 1,000 kva. input to the set. When there is no load on the generator this 1,000 kva. is practically all zero per cent power factor leading. As the generator becomes loaded the numerical value of motor current or kva. remains practically constant, with the power factor changing as the kilowatts increase.

The chart of the 2,400-volt bus voltage shows no sudden variations resulting in lamp flicker due to the furnace operation. The sudden changes of about 1½ volts, showing on the chart, are caused in some instances by load changes and in others by the substation operator adjusting the field of the 3,000-kva. condenser. They are not visible as lamp flickers, either because the changes are at too slow a rate or because they are of insufficient magnitude.



ARRANGEMENT at Vassar substation, from which the two single-phase furnaces were served

Selling a Rate Cut

[*Continued from page 41*]

that here was a call being made in his interest he began to loosen up, his initial antagonism would drop away, and if some complaint had been lodged in the back of his mind he'd start telling what it was.

The interviewer made no attempt to sell. Where the customer made a direct inquiry, on his own volition, about a particular piece of equipment, the interviewer noted him as an "immediate" prospect and offered to have some one call on him concerning the service in question.

Complaints were handled immediately, as the canvass progressed. Unusual, specific troubles were reported to a complaint squad of twenty highly trained employees. Complaints having to do with service were reported to the utilization department at once. Complaints also were reported on the interview card and constitute, as a whole, a valuable guide to the company's customer relations program.

At the conclusion of the interview a card signed personally by the interviewer was left. This explained the rates and how to read the meter. Punched to hang near the meter, it carried a convenient table by which the customer could figure his own bill.

Calls were generally made by day, but where the customer desired it they were made at night. Interviewers averaged about ten calls per day and completed the whole job in less than 80 days.

With its entire commercial department thrown into this work, Public Service expected its load-building activity to register a decline. Such was the case. But its minor character was surprising, the quick rebound gratifying, a situation which resulted in part, no doubt, from the mere exposure of customers to 2,000 calls per day.

Quick Recovery

The canvass was followed by meetings with dealers and a load-building campaign. After the canvass, both company and dealer sales continued high, establishing a trend which probably will have restored revenue within a year.

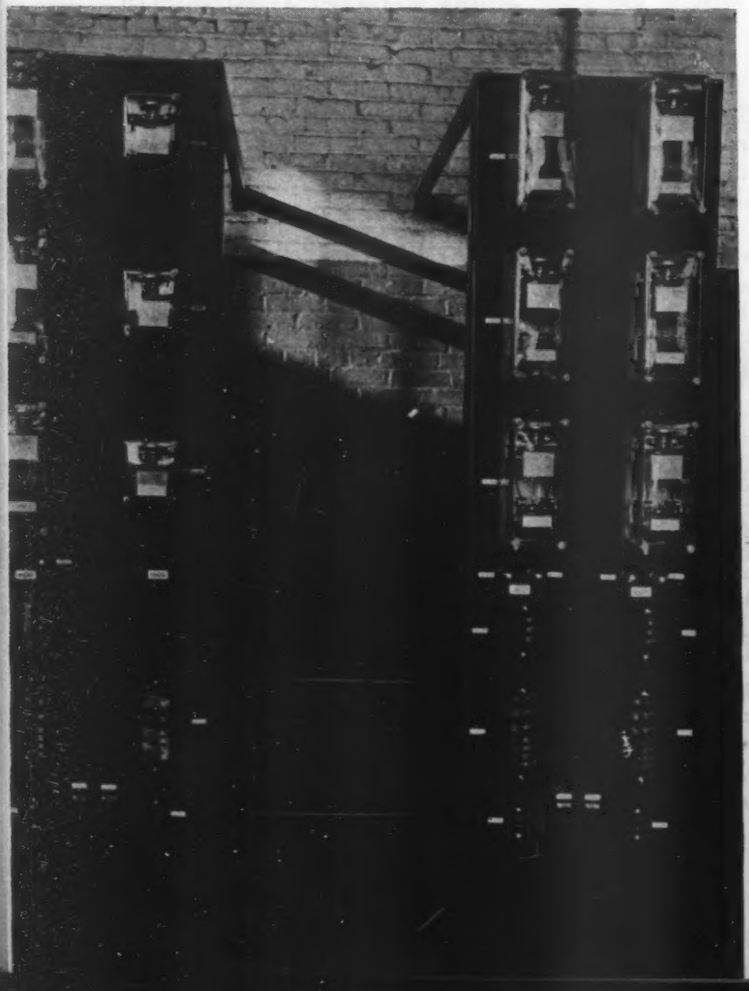
But that is an incidental to the real purpose of the canvass itself. Since the calls were made service complaints have decreased by a substantial percentage and high bill complaints have dropped to less than half what they were before. These are merely outward signs that Public Service has in some measure achieved what it set out to do—assure continuing good public relations by establishing a sound, friendly groundwork underneath.

Plug-in Devices Maintenance,

GEORGE S. VAN ANTWERP,

Plug-in relay readily removed for test or replacement (33-kv. substation)

Plug-in relays and test switches in receptacles mounted and wired on rear of steel panels (33-kv. substation)

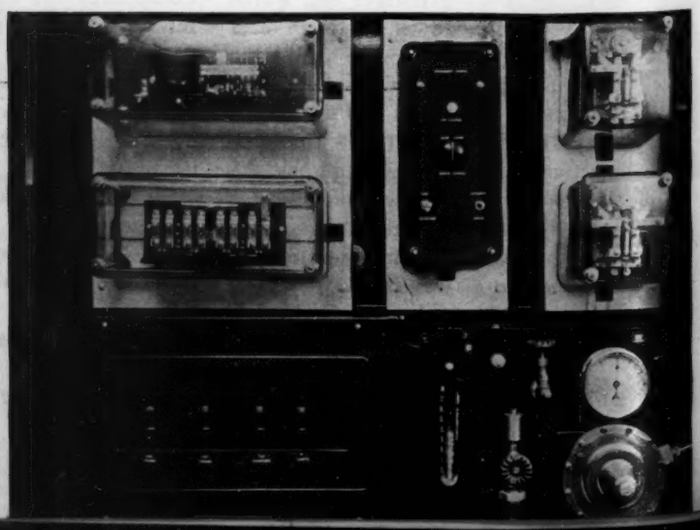


IF WATT-HOUR METERS can be made detachable from sockets, why not relays, ammeters, voltmeters, lamps, timers, any equipment that is now mounted on switchboards requiring space both back and front, drilling, studs, formed wiring, etc? Why not consider the switchboard as a metal-supporting structure of any suitable shape or form on which to mount and protect the front-connected receptacles into which the prongs of the various pieces of equipment can be inserted or removed? No reason can be cited if the results are worth while.

In examining switchboard equipment in the light of present requirements we find that present-day equipment such as meters, relays, control switches, etc., operate with moderately low voltages of both direct and alternating currents, usually requiring several circuits. They can be considered as small electric appliances which in the portable form are connected and disconnected by means of flexible cords, plugs and receptacles. A plug and receptacle is only a form of knife switch, a device which is satisfactory for this type of connection. It would be possible to connect the switchboard equipment with cords and plugs to a row of multiple contact receptacles. With such a change one might ask the question, why have the cord if the plug can be made part of the equipment. This has been done with radio tubes and plug-in watt-hour meters. So, if appliances and watt-hour meters, why not the devices that we needed on control panels?

Use of conventional switchboard type of equipment at places where periodic test, inspection, adjustment and change must be done at a disadvantage raises a question

Channel structure holds wires and receptacles for plugged-in



Promise Easier Lower Cost

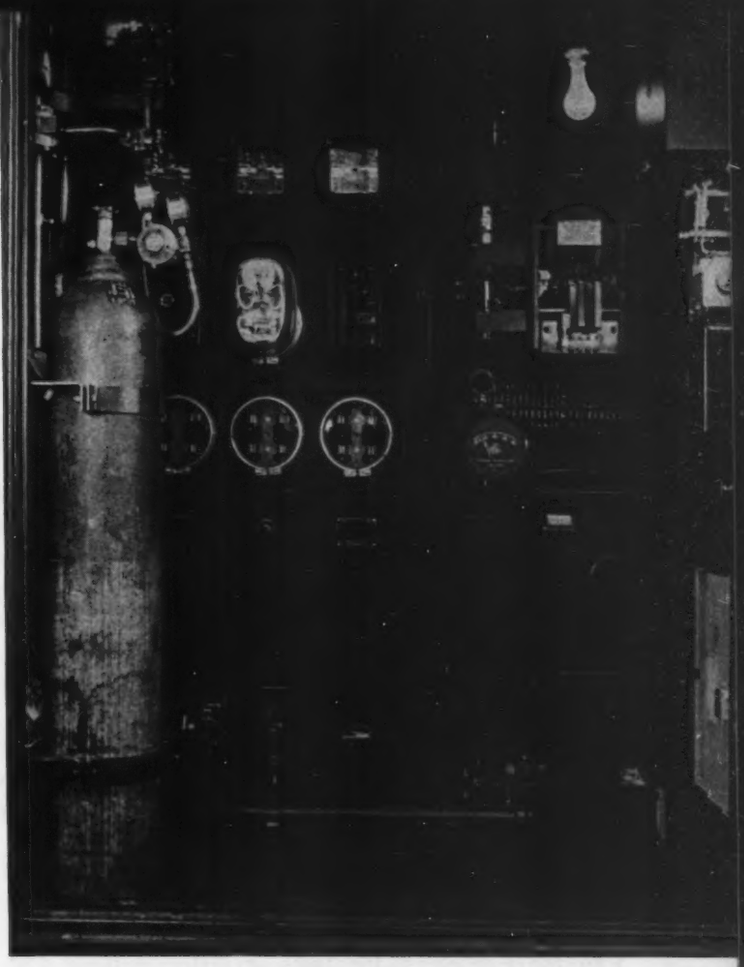
Philadelphia Electric Company

concerning this general type of installation. The penalty is greatest in a distant outdoor switchyard where proper facilities for housing are inadequate, with the result that the equipment does not get proper attention. Even on a small board it is no simple matter correctly to disconnect the various circuits, remove the wires from the studs, reconnect a spare or be forced to leave the installation partly protected until the job can be done correctly. In larger stations the work can be accomplished more easily, but even so there is a possibility of errors with men working on a board loaded with a network of wires and exposed terminals.

The present type of switchboard has developed from the time when instruments were connected directly in the power circuits. The boards themselves thus needed high insulation, were usually attended and required a pleasing appearance. The transition to remote control, dead-front requirements and other construction materials has been smooth, but has not broken away from the earlier arrangements. Switchboards are needed for utility in this age, rather than for beauty.

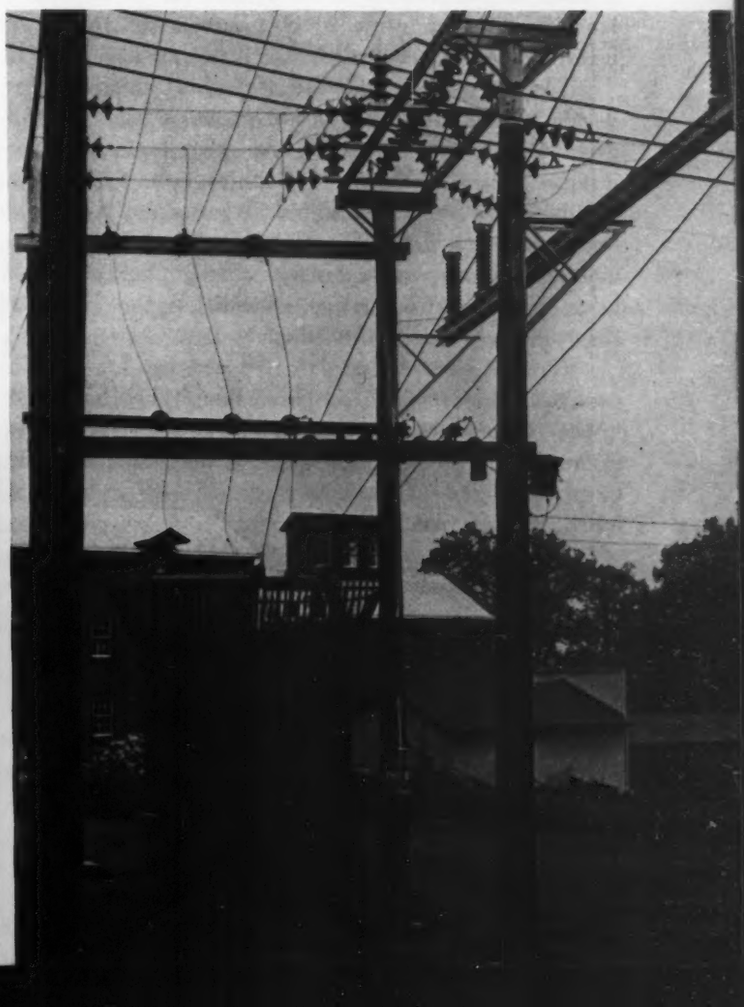
Instruments, relays and meters for switchboard use are generally of the back-connected type, requiring formed wiring, test switches, special drilling, and generally are not interchangeable. This gives an inflexibility for alterations both as to space requirements and to wiring connections. They are "tailor-made" jobs which "ready-to-wear" might better serve. Far too often the switchboard has been built first and the equipment made to fit. Frequently when changes are necessary the old panel is plugged and redrilled for the new equipment.

[*Continued on page 101*]

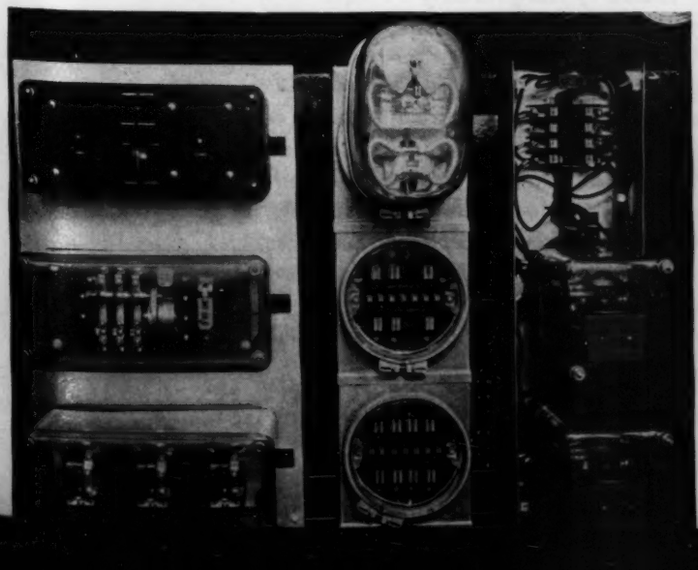


Unit substation (1,000 kva.) controlled by completely assembled plug-in board

Unit substation installed under existing bus



Instruments and equipment in new-departure substation practice



Editorials

S. B. WILLIAMS, *Editor*

A Public Policy Might Isolate Trouble

INVESTIGATIONS of two utility properties, one a holding company and the other an operating company, are disclosing performances that were not in the public interest. It matters not that these happened some time ago or that those responsible are no longer associated with the companies, the facts as disclosed make fine newspaper headlines which serve to turn public suspicion on all utilities.

In the past when utility baiters wanted to make an attack on the utilities they generally had at hand one or two examples from which they let the public take the natural implication. It would be surprising indeed if some of the leaders in the present public ownership bloc did not make use of the findings of these two investigations as propaganda for their cause.

The unfortunate part of the whole thing is that it cannot be localized to those companies being investigated. Public utilities are not like other businesses. For instance, when McKesson & Robbins went through its scandal the pharmaceutical industry was not ostracised for harboring a bunch of crooks. However, let a major holding company or operating company get into an unsavory bit of trouble and immediately the finger of suspicion is leveled at the others.

It is needless to go into the reasons for such a condition. It is enough to know that it has happened in the past and can happen again. The problem is how to minimize its injurious effects on the innocent, for certainly as long as men live errors, with or without intent, will be made.

Does it not come down to the necessity for an affirmative statement of public policy on the part of the industry? Although utilities may be tarred with the wrongs of others, in all reason they cannot be their brother's keeper. They can, however, give utterance as often as necessary to a straightforward public policy that can have the effect of substantially isolating the damage of any wrongdoing.

Furthermore, the development of such a policy would be not only defensive but would tend to give the public a much more favorable impression of the industry and what it stood for.

The Leaders —— Dow, Griffith and Kerr

WITHIN the past month three outstanding utility executives who have grown old in the industry have given over the reins of active management to younger men while they retired to the less arduous task of chairman of the board, or honorary president—Alex Dow, Franklin T. Griffith and Frank M. Kerr.

Mr. Dow in Detroit, Mr. Griffith in Portland, Ore., and Mr. Kerr in Montana have for upward of half a century been the electric service industry to their customers. The thing, however, that they probably never sensed, nor did the citizens of their areas, is that the success and expansion of the communities they served were in no small measure due to their efforts. A less courageous person in their place, or one with less vision, might easily have altered the economic trend of any one of these areas.

Not only, however, did these men find time to build large systems but they have contributed to the welfare of the industry of which they were a part. They have left the impress of their thinking on many important trends.

Their passing from active service all at about the same time brings forcibly to mind the fact that the men who gave this industry direction in its earlier years are nearly all gone from active management. We are no longer an industry of pioneers. We are in our second and third generations.

Nevertheless, the rules that these pioneers laid down for successful utility operation still hold—build well, give good service, treat the customer fairly and give him low rates. It is doubtful if any succeeding generation can improve on these.

Safety Lighting Becoming More Popular

LAST YEAR the Junior Chamber of Commerce put on sixty-three local street and highway safety lighting programs, getting definite results in a large percentage of cases. This year it begins to look like a much larger number of local efforts would be undertaken by this group. As an indication, so far this year 117 local radio stations have applied for a fifteen-minute J. Edgar Hoover record on "Safety with Light."

More than 2,400 weekly and daily newspapers gave

space to safety lighting one or more times last year, and at the present time newspapers with a checked circulation in excess of five millions are using a monthly cartoon series on highway safety lighting.

We mention these activities merely to indicate that street and highway safety lighting is catching the public eye. It is becoming a popular subject. Still the complaint is that it is not receiving the support it should get from the public utilities.

Perhaps the load isn't very profitable. Perhaps there is a contract now running. Perhaps there are arrears on payments from street lighting. Perhaps there are a number of reasons why the utility would rather set its sales effort in some other direction.

Nevertheless, the subject is now becoming popular and has every indication of becoming more so. By taking the lead the utility can not only build a certain amount of lighting load but it can also improve its public relations.

More and more data testify to the effectiveness of light in reducing night-driving fatalities and accidents. Whatever agency promotes lighting for that purpose is bound to leave with the public a better impression.

Public Ownership Defaults

VERY few power projects were among the 300 municipal and other political subdivision operations that failed to meet principal and interest payments on bonds held by PWA or RFC. Since most of them got under way too late to have been in default on anything it can only be surmised that essentially the same situation will prevail there as with water supply projects.

When a project receives not only the benefit of low interest but in addition an outright gift from the government of a substantial part of the cost, it is nothing but stark tragedy when interest and principal payments are defaulted. The only obvious conclusion that can be drawn is that the project was never necessary and was never wanted except as something to bring government money into town during construction. Government officials seem to believe that a large part of these "sour" projects can be cured. This is merely putting off the evil day when the government either must write off the investment (which some expect it to do as it has done in the past) or else turn the property over to someone who can make it pay.

In the meantime the excursion into the field of private enterprise has alarmed investors and caused the utilities to be wary about expansion. The good effects of the government spending were but momentary. The bad effects have had a lasting value.

It would be surprising indeed, if ever an audit could be taken, if the expenditure which the utilities would have undertaken, were it not for the threat of government competition, were not larger than the money that was poured into municipal ownership—not to mention the loss in taxes which government might have used in other more fertile fields.

Performance Testing for Residential Equipment

WHAT does the public know about performance of electrical equipment? How much does it have to take on faith because it trusts the dealer or because the manufacturer has a reputation for quality? Merchandise is sold as being able to do certain things. Will it? Too frequently the only way the customer can find out is to buy it and use it for a while.

What should good performance be? Is it fair to the customer to leave the decision entirely in the manufacturer's hands, especially when competition may force decisions that otherwise would not be made?

For a long time the industry has talked about the electrical devices that have found their way to the attic. Sometimes selling has been blamed, sometimes inadequate wiring. Is it not possible that more frequently the device has not performed as well as the customer expected?

Several years ago people began to turn away from ceiling and wall bracket residential lighting fixtures, especially in the living room. Interior decorators were blamed for this trend. Would the public have listened so quickly to the decorators had the fixtures given good and satisfactory performance? Suppose they had given enough light and without discomfort, would not their very convenience have saved them?

The only general standard for electrical home devices is that of Underwriters' Laboratories. Underwriters' listing or approval, however, is based not on performance but on safety to life and fire characteristics. On lighting equipment, for instance, the Underwriters' specifications are not concerned with the lumen output, or the distribution, or the brightness. They are concerned with the absence of cutting edges, with the switch and socket, type and size of wire—things that might bring about grounds or fires.

Beyond such a standard, which for portable equipment is very hard to police without a sales control ordinance, the public has nothing in the way of performance listing other than the individual manufacturer's guarantee. Considerable discussion is taking place at this time regarding the desirability of such a listing.

When we see the way the public accepted the I.E.S. lamp because it had a performance tag we have sufficient evidence at least to warrant a similar effort being made with some other device or line of devices.

Performance listing under some suitable and quickly recognized tag or trade-mark should greatly simplify utility load building in the residential market.

Distaste for Strawberries

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

REMEMBER that Soviet agitator who came over here a few years back and was exhorting a small gathering of the faithful?

"Look at these capitalists," he shouted. "They smoke big black cigars and they eat strawberries in January. Comes the revolution, *we'll* smoke big black cigars. *We'll* eat strawberries in January.

"But, comrade," piped up a little fellow in the back row, "I can't eat strawberries. I break out in a rash."

After a baleful glare the agitator, through gritted teeth, snarled at the little fellow: "Comes the revolution, *you* will eat strawberries."

It's the most curious thing how some people just don't like a certain flavor, or are afraid of a little rash!

For instance, Jerome Frank—and Leon Henderson. Who would have thought, when these two outstanding toilers in the New Deal vineyard were put on the Securities and Exchange Commission, that they would suddenly develop a distaste for strawberries?

Certainly not Ben Cohen and Tommy Corcoran, who had considered they practically had the SEC in their pockets, even while William O. Douglass was chairman, and thought they had that control copper riveted when Douglass was replaced by Jerome Frank.

A Pleasant Surprise

Why, the conservatives thought Frank was little short of a bomb thrower! Maybe so, but a bomb thrower who doesn't like strawberries.

Here Bob Jackson, now in the Attorney-General's chair, and Corcoran and Cohen, not to mention George Norris, though he was in on the play, had it all set for the SEC to be appointed receiver for the Associated Gas & Electric Co. But when SEC took up the matter, how did Frank and Henderson vote? They voted "No." Not only that, but when the newspapers began to speculate on the vote, Jerome Frank called up the correspondent of the New York *Times* and wanted it made clear that he and Henderson had voted with George C. Matthews and Robert F. Healy against taking the receivership.

That leaves, incidentally, only Edward C. Eicher in the clear, so far as the White House janizaries are concerned. He voted *for* accepting the receivership.

The important question here is not *who* is to be receiver for the Associated, nor *why* Frank and Henderson decided not to have any strawberries. It is why the Jackson-Cohen-Corcoran combination wanted SEC to be receiver for this electric utility holding company.

Obviously, it would be going counter to every tradition in receiverships for a court to appoint as receivers for any corporation a person or agency whose chief desire would be to take the property of the security holders away from them. It has often been charged, of course, that this has been done in various instances. But the allegation was regarded as being on a par with a charge of orphan and widow robbing. In fact, it frequently amounted to just that.

But here the Attorney-General of the United States solemnly asks a court to appoint as receiver an agency which the Attorney-General thinks will be guided in its conduct of the affairs of the company by a desire to spread government ownership. There is no intimation here that Bob Jackson, or Cohen and Corcoran, do not think public ownership is in the interest of the people. But aren't they being a bit ruthless about it?

Sort of like Harold Ickes, who is so mad with the people of San Francisco because they keep refusing to vote themselves further into debt in order to have a publicly operated electric distribution system that he is now resorting to the courts to try to deprive the Golden Gate city of Hetch Hetchy power!

It so happens that Senator Burton K. Wheeler and Democratic House Leader Sam Rayburn, who fathered the "death sentence" bill in Congress, both protested to the SEC that it should not take this receivership. But in the face of this, as well as the four to one vote in the SEC itself, Jackson later insisted that the court appoint the SEC.

Even after the defection of Frank and Henderson, that dream of a federal agency in Washington directing the electric business of the country—for of course they envisioned other receiverships as the death sentence continues to operate—could not be abandoned.

This should really surprise no one who has studied the career of Robert Jackson in the New Deal. His attitude has always been that he, as the employee of the government, should get everything he could for that government, regardless of the rights of individuals or minorities.

Pay, or Else ——

When his job was in the income tax division he was noted for refusing to be concerned with any court precedents when he was pressing a claim. No matter how right he might be, the taxpayer found himself obliged to pay at least the "nuisance value" of the case to the government, or else go to court. In short, he could settle his case out of court by a "compromise" which would be just a little bit less than what it would cost him to take it through the lower and appeal courts. Of course this meant that if it was for a small amount, he might as well pay in full what Jackson demanded. He would save money by doing it, though from court precedents it was perfectly obvious the government was *not* entitled to the money and that he would win if he fought it through.

This policy produced fine results for the Income Division, financially, and Henry Morgenthau was delighted. Which is perhaps one of the reasons Morgenthau is now supporting Jackson against those radicals who won't eat strawberries.

NEWS OF THE WEEK

Seattle Utility Confident of Territory Progress

President McLaughlin of Puget Sound Power & Light says company has faith that employees and investors will be treated fairly — Budgets construction expenditures of $2,427,098

Viewing the future with a great deal of optimism and confidence in the industrial and economic progress of the territory it serves, Puget Sound Power & Light Co. plans expenditures of $2,427,098 this year for new construction. Last year the company spent $1,585,518 for this type of work.

President Frank McLaughlin said that this program is going forward "because of the confidence the company has in the future of the state and because of the faith it has that its thousands of employees and investors will be treated fairly." The 1940 budget will provide "more and better service for our busier and more numerous patrons," he declared.

Face Many Problems

The action of the company is highly encouraging when it is considered that the spread of public ownership, organization of public utility districts and disposition of power from Bonneville present many difficult problems. In the face of all these, the company is expanding facilities and extending service. Recently the utility inaugurated a dealer program to build load on the system and to expand service among its customers. The gratifying results so far obtained caused the company to expand the program.

The budget contemplates expenditures of $182,968 for power plants, against $173,096 last year; $1,812,564 on transmission and distribution lines, substations, meters, transformers, etc., against $1,294,201, and $315,864 for bus properties, against $151,863. Other items total $115,702, against a credit of $33,642 offset by proceeds from sale of property and timber.

Last year the company constructed 640 miles of rural line extensions to serve 1,200 customers. The company now has approximately 92,000 rural customers and a total of 196,244 of all customers, an increase of 5,831 during the year. The average annual residential use is 1,391 kw.-hr., against 1,334 kw.-hr. in 1938.

Line extension activity is not as strong in the company as in some utilities, since more than 90 per cent of the people in the general area are served. In King County more than 99 per cent of the people living outside of incorporated cities and towns are receiving electric service. This saturation, Mr. McLaughlin said, is due to the uniformity of low rates in rural and urban areas, which has been the company policy for a number of years and which is responsible for the Washington Department of Public Service stating: "Generally speaking, the new rates are lower than those offered by any private or public utility anywhere in America serving a like area."

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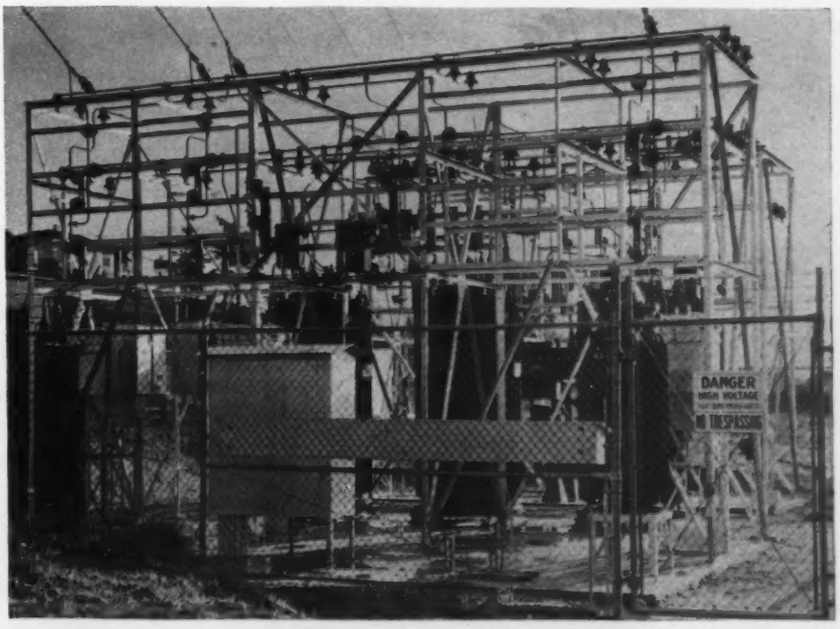
Public Ownership League

A statewide meeting will be held in Yakima on March 16 to organize a Washington Public Ownership League.



NEW SUBSTATION—Low-tension side of the new Magnolia substation of Puget Sound Power & Light showing the 4-kv side, which supplies regulated service to three residential feeders within Seattle. Possible future additions are provided

Courses on Lighting Draw Wide Interest

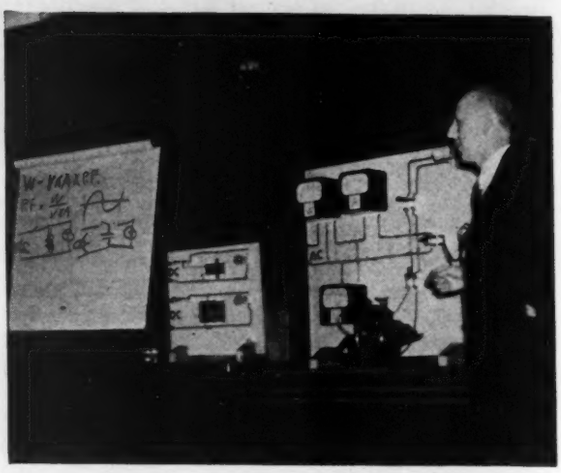
Probably the most ambitious and successful fluorescent lighting school to be undertaken by a non-profit organization was concluded last week by the Chicago Lighting Institute after having been extended two days over its original three-day span to care for an unusually large attendance. More than 1200 "students" from twelve states and Canada attended the five identical one-day technical sessions, in which utility and manufacturers' lighting engineers acted as instructors.

Representatives attending the school included jobbers, electrical dealers, wholesalers, electrical contractors, manufacturers of fluorescent lighting equipment, utility lighting engineers, airway, telephone and railway company representatives. In addition to these, fifteen city officials attended.

Each one-day school term consisted of eight "courses" covering (1) fluorescent lamps and auxiliary characteristics and operation; (2) significance of power factor in electrical systems, including influence on voltage drop and wiring capacity; (3) a pictorial review of installations by types; (4) general luminaire and lighting installation design covering points to be observed in the design of efficient luminaires for fluorescent lamps to give quality illumination for various uses; (5) discussion and demonstration of available luminaire types; (6 and 7) problems in the calculation of illumination values for both incandescent and fluorescent installations and (8) the sale of fluorescent lighting—its advantages, disadvantages and economics.

The fluorescent lighting school was organized and presented by the committee on education of the Chicago Lighting Institute, with L. V. James, General Electric Lamp Company, committee chairman and Carl W. Zersen, director of the institute, acting as secretary.

LIGHTING — More than 1,200 "students" from twelve states and Canada attended the recent fluorescent lighting school of the Chicago Lighting Institute. Right is W. A. Lindberg, Commonwealth Edison, explaining power factor. Above (l. to r.) R. G. Raymond, Commonwealth Edison, summarizing the session discussions; C. W. Zersen, director of the Chicago Lighting Institute, with E. D. Tillson and O. W. Bard, Public Service Co. of Northern Illinois.



Registration for each of the five days was limited to 240 by the facilities of the institute and it is interesting to note that a full attendance was had at all five days. Director Zersen reports that inquiries and requests for copies of mimeographed lesson outlines came from as far away as Cuba.

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Whiteford Resigns as Head of Associated Gas System

Roger J. Whiteford, who succeeded John I. Mange as president of Associated Gas & Electric Co. less than a month before that concern filed a petition to reorganize under the Chandler Act, has submitted his resignation as president to the company's board of directors.

Mr. Whiteford was elected president of the utility on December 12, 1939.

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Votes Condemnation

Snohomish County utility district No. 1, Everett, Wash., has voted to condemn the properties of Puget Sound Power & Light in the county.

Montreal Utility Sees Need for More Power

Montreal Light, Heat & Power plans immediate development of potential power resources in order to keep pace with expansion of power demands, John S. Norris, president, told stockholders at the annual meeting.

"Inasmuch as our Beauharnois plant is the most expeditious and economical of our resources to develop, we have applied for the right to utilize an additional 30,000 c.f.s. of the waters of Lake St. Francis to enable us to produce further 240,000 hp. at this plant," he declared.

Last year the company spent approximately $2,500,000 for additions and betterments.

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Sets New Sales Quota

Average residential use in Georgia Power Co. territory was 1,446 kw.-hr. in 1939, as against 1,398.8 kw.-hr. in the preceding year, an increase of 3.4 per cent. The company has set a merchandise sales quota of $2,500,000 for 1940.

Electrical Trade Groups Attend Joint Convention

St. Paul meeting attracts 1,200 representatives from eleven associations — Discuss street lighting, sales and load building, rural electrification and wide range of topics

The electrical industry in the North Central area centered its attention on St. Paul, Minn., last week where 1,200 representatives of eleven electrical trade groups attended joint conventions held in conjunction with the biennial exposition of the North Central Electrical Manufacturers Club.

Groups participating included the Minnesota Electrical Association and Council (contractors), North Central Electric Association (private utilities), State Inspectors Association, Minnesota Municipal Utilities Association, Minneapolis Electrical Contractors, North Central Electrical Manufacturers, Minneapolis Electric Appliance Dealers, North Central Association of Electrical Industries and St. Paul Master Electrical Contractors.

Joint Meetings

More than 120 private and 50 municipal utility representatives assembled at joint meetings to discuss subjects ranging from street lighting through sales and load building to the progress of rural electrification.

At the joint meeting of the Minnesota Municipal Utilities Association and the North Central Electric Association, L. L. Perry, Northern States Power Co. discussed dealer co-operative programs for load building; Henry J. Morton, E.E.I., described advantages of the use of the new wiring materials; fluorescent, sodium and mercury-vapor and other light sources, introduced to the industry in recent years, were covered in a lecture by A. B. O'Day, General Electric Co., Nela Park; trends in street and highway lighting were the subject of a paper by Paul Reed, General Electric, presented at the luncheon meeting of the central station group.

Considerable interest in fluorescent was evidenced by a large attendance at an evening meeting of the Minneapolis Electrical Contractors Association and the St. Paul Master Electricians, at which D. W. Prideaux, General Electric, and Larry Paist, Northern States Power Co., outlined the application of fluorescent lamps and auxiliaries touching on power-factor correction, fixture design, fluorescent lighting economics and associated subjects. Fluorescent lighting was also the subject of a second paper by A. B. O'Day, General Electric, at the "all-industry" luncheon.

Dr. G. W. Allison, Modern Kitchen Bureau, presented a paper, "This Appliance Business," at the "all-industry" session on Wednesday, at which a paper was also presented by W. H. Thompson, Westinghouse, on "Our New Rural Customers," also one by Frank E. Watts of *Electrical Dealer*.

Other papers of interest to the utility field were given by Oscar Gaarden and S. E. Blunt, Northern States Power Co., on the competitive power situation and industrial heating, respectively. D. H. Steeves, Montana-Dakota Utilities Co., discussed commercial lighting; C. T. Bremicker, Northern States Power, domestic lighting; T. E. Roche, Interstate Power Co., small industrial lighting; J. H. Murray, Eastern Minnesota Power Corp., street lighting; C. W. Bade, Northern States Power Co., municipal relations problems; Carl Johnson, Otter Tail Power Co., domestic load building through utility merchandising; C. M. Baldwin, Minnesota Power & Light Co., domestic load building through dealer set-ups, and E. A. Stewart, Interstate Power Co., rural developments.

CONVENTION—More than 1,200 representatives of eleven electrical trade groups attended the joint convention last week in St. Paul. L. to r.—Elnathan Gates, president of North Central Electric Association; Henry Morton, E.E.I., and Lee Nelson, president of Minnesota Municipal Utilities Association

Miltenberger Quits Union Electric Post

Resignation of George K. Miltenberger as vice-president of Union Electric Co. has been announced by William McClellan, president. Mr. Miltenberger will be retained in the engineering service of the company at a reduced salary. The change is effective March 1.

At the same time President McClellan announced that Hermann Spoehrer, who was required to resign January 9 from the office of secretary, would be assigned to company work at a reduced salary on March 1.

The SEC and government attorneys are investigating the handling of rebates and "kickbacks" which went into political and lobbying slush funds. The affairs of the company have been under investigation for some time.

Louisville Gas & Electric Facilities Sought by City

Louisville Gas & Electric is being faced with three immediate problems. The Federal Power Commission, the state of Kentucky and the city of Louisville, each with a different purpose, are creating worry for the utility.

Louisville, through a representative in the Legislature, has introduced a bill to enable the city to purchase the company; the state, through the Public Service Commission, is making a study of the company's business with a view to a reduction of rates if evidence warrants, and the FPC has ordered the company to show cause by March 11 why the district court should not be asked to force the company to give an accounting of its business activities.

E.E.I. Equipment Group Holds Cincinnati Meet

Engineers discuss physiology of carbon dioxide, plant modernization, standardization of appliance tests, resistance welding, equipment ratings and wide range of topics

Physiological effects of carbon dioxide exposure, non-destructive testing of generator insulation, noise reduction in 3,600-r.p.m. stations and utilization equipment voltages were major topics at the Cincinnati meetings of the E.E.I. electrical equipment committee last week.

Supplementing W. W. Archer's comprehensive description of the modernization of Virginia Electric & Power Company's Twelfth Street station, E. S. Fitz gave the results of vibration and noise amelioration. A special housing about the 12,500-kw., 3,600-r.p.m. machine reduced the annoyance level by 2.5 to 13 decibels, with about 45 per cent improvement in the 2,000 to 8,000 cycle frequencies. Inclosure of the boiler instrument board effected a 60 to 80 per cent reduction. The steam-reducing value (for low-pressure operation with superposed unit out) is a remaining noise problem.

Fighting Fires

R. N. Conwell (P. S. E. & G.) presented an extensive compilation of authorities on toxicity and asphyxia from exposure to carbon dioxide concentrations. Little hazard was shown for windward-side fighting of outdoor fires, but it may be desirable to limit the size of tanks by proportionality to volume of inclosed spaces to which each may be applied. Eric Goertz (Cardox Corp.) gave reassurance by stating that the time involved in fire extinguishment is much shorter than required for toxic consequences. Among other data he stated that 12 to 18 per cent CO_2 concentration is typical 20 ft. in front of a nozzle.

A progress report by R. L. Webb (Consolidated Edison) indicated that possibly the much-sought criterion for condition of generator insulation might prove to be the ratio of insulation resistance readings at two different d.c. voltages, one of them comparable to rated voltage. It was reported that J. G. Biddle has offered a 5-kv. megger that may later be available in motor-driven form for extended readings.

Plea for wide dissemination among industrial men of the resistance welding reports presented at the recent A.I.E.E. convention (ELECTRICAL WORLD, February 24, 1940) was made by L. W. Clark (Detroit Edison). R. N. Conwell said several of two recently devised meters for welding loads are to be placed in trial service in the hope that they may reverse the "proverbial procedure of setting a rate and then looking for the meter for it."

Uniform Specifications

Prospective agreement by manufacturers on uniform specifications for range tests was vouchsafed by J. H. Foote (Commonwealth & Southern). J. O. Coleman (E.E.I.) said some 30 different ratings of water heater elements had now been reduced to seven as a result of joint study. J. H. Foote also presented an initial analysis of voltage data from 45 companies serving 10,000,000 customers. It appears that most distribution engineers are designing for a 10-volt spread. It was stated that the objective of the research is to give lamp, appliance and small motor manufacturers data on upper and lower limits to which to design their products and ultimately to reduce the spread in values between utilities.

It was decided to dissent from the conflicting symbols for resistance, reactance, windings, capacitances, contactors and fuses appearing in a report now on the way to A.S.A. submission and to ask for reconsideration. A. E. Silver (Ebasco Services) announced that the new Meterman's Handbook will probably be available about March 15.

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Rules on Retroactive Tax Liability in Indiana

In a substitute opinion the Indiana Supreme Court again has upheld the constitutionality of a 1939 act relieving municipal utilities from all excepting gross income tax, but in the substitute opinion has held that municipalities must pay any taxes levied in 1938 and due last year. The case arose in a Circuit Court at Crawfordsville, the city suing to enjoin officials from collecting property taxes on the municipal light plant. The city won and an appeal was taken by the county treasurer.

Last December the Supreme Court upheld the lower court, ruling that the city would not have to pay any back property taxes. The substitute opinion just issued, however, differs from the other on the point of retroactive tax liability. It holds the law was intended to relieve municipalities only in the future and pointed out that the 1939 act carried no provision for the refund of any taxes paid before the date the law became effective.

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REA in Controversy Over Power Contract

A letter has been sent to all members of Minnesota rural electric co-operatives financed through REA urging them to refuse to sign a contract for the purchase of power from Northern States Power Co. because of the basis upon which the energy charge is made.

Assistant Administrator Robert B. Craig charges that attempts are made to base the charge for energy, in substantial part, upon the largest quantity of energy used in any single fifteen-minute period during a year. He said that no other contract to supply power to REA co-operatives has contained such a provision.

Mr. Craig said that signing of the contract would bind the REA Co-ops for five years, put a "false-bottom" in all wholesale power charges, make it virtually impossible for the rate ever to go below 1¼ cents a kilowatt-hour and would tend to raise some rates to some users.

Robert F. Pack, president of Northern States Power, stated that the company is not forcing any contract on any co-operative. "Any contract which has been signed by any co-operative was signed because the co-operative desired to do so."

J. Seneca Jones, executive secretary of the Minnesota Farm Bureau Federation, charged that Mr. Craig, "apparently in an effort to divert attention from the glaring incapacity of the present REA administration, goes too far when he libels the farmers of Minnesota. His insolent charge that Minnesota farmers are permitting themselves to be used as tools of the power trust should be immediately retracted." He charged that Minnesota rural electrification has been impeded by Washington officials.

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Plans $1,800,000 Budget

Western Massachusetts Companies plans $1,800,000 of new construction during the year, according to Fred C. Abercrombie, president.

City-Owned Plants Must Pay Sales Tax

Michigan municipalities operating city-owned utility plants lost their court fight against a 1939 legislative act imposing the state 3 per cent sales tax on products of publicly owned utilities when the state Supreme Court upheld the Legislature's action last week.

The high court decision, affirming the ruling of Judge Leland W. Carr of Ingham County Circuit Court, said that municipalities which invade the field of business and industry "should be governed by and subject to the same rules as private individuals or business corporations."

The court upheld the 1939 Legislature's decision that electric light and power and gas sold by municipal plants should no longer be exempt from the 3 per cent sales tax. The Legislature amended the sales tax law to remove the exemption.

"When a municipality elects to engage in a proprietary activity," the Supreme Court held, "it thereby subjects itself to the constitutional power of the state to tax, there being no express or implied constitutional opinion to the contrary."

The 1939 act was challenged by Lansing and seventeen other Michigan communities which instituted the test case in Circuit Court in Lansing.

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Alabama Power to Sell Facilities in Decatur

The Alabama Power Co. has petitioned the Public Service Commission for authority to sell its Decatur distribution system to the municipality, which has built a duplicate system and is distributing TVA power. Hearings have been set for March 4.

The price agreed upon is $193,000, according to E. W. Robinson, operations manager. He said there would be a salvage value of about $100,000 in the private system. At one time the private system was offered to Decatur for about $350,000, the estimated cost of the duplicate municipal system. Competition has been in progress since March, 1939.

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Oppose Seaway

The Niagara County Board of Supervisors has appropriated $2,500 to a fund being raised by the Niagara Frontier Planning Board to oppose the proposed St. Lawrence seaway and power project.

REA MEETINGS—Electric cooking demonstration in Minnesota which drew capacity crowds of REA Co-op customers. This year REA started its farm equipment tour in Texas and will swing through the South to demonstrate use of electricity

REA Traces Growth in Activity Report

Farm power systems financed by REA are making a "favorable showing" financially and the ultimate losses on loans "should be small," Administrator Harry Slattery stated in the annual report to Congress. The report traced the growth of REA and the rise of co-operatives and the spread of electric service in rural areas. One section traces growth state by state.

Mr. Slattery stated that some of the earlier established financed systems show up so well in point of revenues that eleven borrowers have made or arranged to make payments of principal and interest aggregating $79,594 in advance. Some other borrowers, less favorably situated, were unable to maintain the payment schedule, with the result that 27 installments of principal and interest remained unpaid on June 30, 1939, and were thereby defaulted. Defaulted payments totaled $65,716.

Out of approximately $267,000,000 allotted by REA through November, 1939, there had actually been paid out to the borrowers at that time approximately $176,000,000. Collections from borrowers through November aggregated approximately $3,300,000, it was reported. Many systems are not yet due to make amortization payments or to pay interest.

Mr. Slattery reported that "thin" areas are being developed to make the system pay. This is being done by addition of new customers and by increase in use of electricity per customer. He declared that the soundness of the loans in these areas will depend in part upon the economic condition of the American farmer during the next 25 years. REA now serves about 400,000 farms from about 200,000 miles of line.

Louisville to Install 25,000-Kw. Steam Unit

Construction of a 25,000-kw. capacity addition to the Canal station of Louisville Gas & Electric Co. has been authorized by directors, according to T. B. Wilson, president.

The addition at Louisville will bring to 160,000 kw. the total capacity which will be installed by units in the Standard Gas & Electric system and lifts the tentative construction budget of the system to more than $40,000,000 for the year.

Public Utility Engineering & Service Corp., subsidiary of Standard Gas & Electric, will design the new addition.

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Plans New Power System

City authorities have announced completion of an engineering survey and cost estimate for a new distribution system for power soon to be available from the hydro-electric plant at Elephant Butte Dam. New Mexico Public Service Co. now serves Hot Springs.

New Tests on Blades Made by Pictures

New means of power generation which may double the efficiency of even the most modern steam turbine generator and an optical system for studying rotating turbine blades in action were described by M. W. Smith, vice-president in charge of engineering, and F. T. Hague, manager of engineering of Westinghouse Electric & Manufacturing Co. at the meeting last week of the Niagara Frontier section of the A.I.E.E.

It was pointed out that for each 20 degree increase in temperature the plastic flow or creep rate of the steel turbine blades receiving the first impulse of the incoming steam is doubled and other physical characteristics are adversely affected.

In order to learn more about the conditions affecting these impulse blades which receive the brunt of the incoming steam's force the engineers at South Philadelphia have made turbine blades write their own story in a camera. Small mirrors have been mounted inside eight different blades in the first and second rows of blades on the rotor of an experimental turbine. A light beam projected through a hole in the turbine shaft is reflected by an inclined mirror to the mirror in the whirling blade being photographed and then back through the shaft to the stationary camera. By taking pictures every one-half second on the moving film an exact record of blade performance can be obtained for any desired set of operating conditions, Mr. Hague explained.

More than 20,000 photographic records have been made of the performance of impulse blades in a wide range of operating conditions. Because of this research, it is said, engineers can now calculate the impulse blade stresses inside operating turbines and predict whether a particular blade design is safe.

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Young Tom Edison Film

Metro-Goldwyn-Mayer has produced "Young Tom Edison," the first of two features dealing with the life of the famous inventor. The picture stars Mickey Rooney.

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NLRB to Hold Election

After three years of interunion bickering, 31,250 employees of the Consolidated Edison Co. of New York, Inc., system will get their first opportunity to vote on collective bargaining representatives in a National Labor Relations Board election on April 4 and 5. Representatives of seven Edison companies and three unions—CIO, AFL and the newly formed independent organization—have signed a stipulation.

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Save Your Vision Week

The National Better Light-Better Sight Bureau, New York, has published a brochure on suggestions for participation in the national "Save Your Vision Week" to be held March 10–16. There are suggestions for advertising, window displays, radio shorts and the like.

MEETINGS

Northwest Electric Light and Power Association—Business development section, Olympic Hotel, Seattle, Wash., February 29-March 1; engineering and operation section, Davenport Hotel, Spokane, Wash., April 10-12; Accounting and business practice section, Benson Hotel, Portland, Ore., May 23-24. Berkeley Snow, executive secretary, 707 Spalding Bldg., Portland, Ore.

American Society for Testing Materials—Spring meeting, Hotel Statler, Detroit, Mich., March 6; committee week, Hotel Statler, Detroit, March 4-8; annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 24-28. R. E. Hess, assistant secretary, 260 South Broad St., Philadelphia, Pa.

Edison Electric Institute—Annual sales conference, Edgewater Beach Hotel, Chicago, March 18-21; technical committees, Edgewater Beach Hotel, Chicago, Ill., May 6-9; annual convention, Atlantic City, N. J., June 2-6.

Oklahoma Utilities Association — Annual convention, Biltmore Hotel, Oklahoma City, March 18-19. Kate A. Niblack, secretary, 625-626 Biltmore Hotel, Oklahoma City.

Association of Iron and Steel Engineers—Spring engineering conference, Cincinnati, Ohio, April 1-2. Brent Wiley, managing director, Empire Building, Pittsburgh, Pa.

Maryland Utilities Association — Spring meeting, Lord Baltimore Hotel, Baltimore, Md., April 5. J. H. Purdy, secretary, Lexington Bldg., Baltimore, Md.

Midwest Power Conference — Palmer House, Chicago, Ill., April 9-10.

Missouri Association of Public Utilities — Annual convention, Elms Hotel, Excelsior Springs, Mo., April 17-19. Jesse Blythe, assistant secretary, Merchants Bank Bldg., 101 West High St., Jefferson City, Mo.

Electrochemical Society — Spring meeting, Galen Hall, Wernersville, Pa., April 24-27. Dr. Colin G. Fink, secretary, Columbia University, New York, N. Y.

American Society of Mechanical Engineers — Spring meeting, Worcester, Mass., May 1-3. C. E. Davies, national secretary, 29 West 39th St., New York, N. Y.

Southeastern Electric Exchange — Annual conference, Hotel Roanoke, Roanoke, Va., May 9-11. J. W. Talley, executive secretary, 308 Haas-Howell Bldg., Atlanta, Ga.

National Fire Protection Association — Annual meeting, Atlantic City, N. J., May 6-11. Robert S. Moulton, technical secretary, 60 Batterymarch St., Boston, Mass.

National Electrical Manufacturers Association — Spring meeting. The Homestead, Hot Springs, Va., May 12-17. W. J. Donald, managing director, 155 East 44th St., New York.

National District Heating Association — Annual meeting, French Lick Springs Hotel, French Lick, Ind., May 14-17. John F. Collins, Jr., secretary-treasurer, 1231 Grant Building, Pittsburgh, Pa.

National Electrical Wholesalers Association—Annual convention, The Homestead, Hot Springs, Va., May 19-23. E. Donald Tolles, managing director, 165 Broadway, New York, N. Y.

Pacific Coast Electrical Association—Annual convention, Hotel Oakland, Oakland, Calif., May 22-24. Harold O. Noack, Hubbard & Co., Oakland, convention chairman.

Bennion Sees Utility Progress in Future

The efficiency of steam stations has now approached the maximum possibilities of the steam cycle, but scientists and engineers are not stopping there in their search for means of capturing a bigger percentage of the energy locked up in a pound of coal, Major H. S. Bennion, vice-president and managing director of the Edison Electric Institute, told the New York section of the A.I.E.E. at its meeting last week. Major Bennion said that this energy in a pound of coal is equivalent to the energy of a ton of water falling a distance of one mile.

"The gas turbine, now a reality, promises higher efficiency, and still other means to make still greater gains are under study," he said.

In a discussion of the progress of the electric utilities under private ownership, Major Bennion traced the history of the industry and the substantial gains it has made in advancing greater use of electricity. He said that the public generally concerns itself little with past history and looks for possibilities of new progress and leadership. He saw new avenues opened for greater efficiency in utility facilities and wider use of service.

The federal government has superimposed over existing state and local regulations overlapping federal regulations to place narrow limitations on the exercise of managerial powers of private enterprise, extracting much of the initiative from that potent essence known as private initiative, which has been such a powerful producer of good things in the past, he declared. "Through short yardsticks and birch-rods, it is enfeebling the hope of reward, that other potent producer in the past of good things now enjoyed, for it is the hope of profit which stimulates progress." Under regulation which usurps the functions of management, progress tends to stop and improvements, instead of being the usual thing, become rare occurrences, Major Bennion declared.

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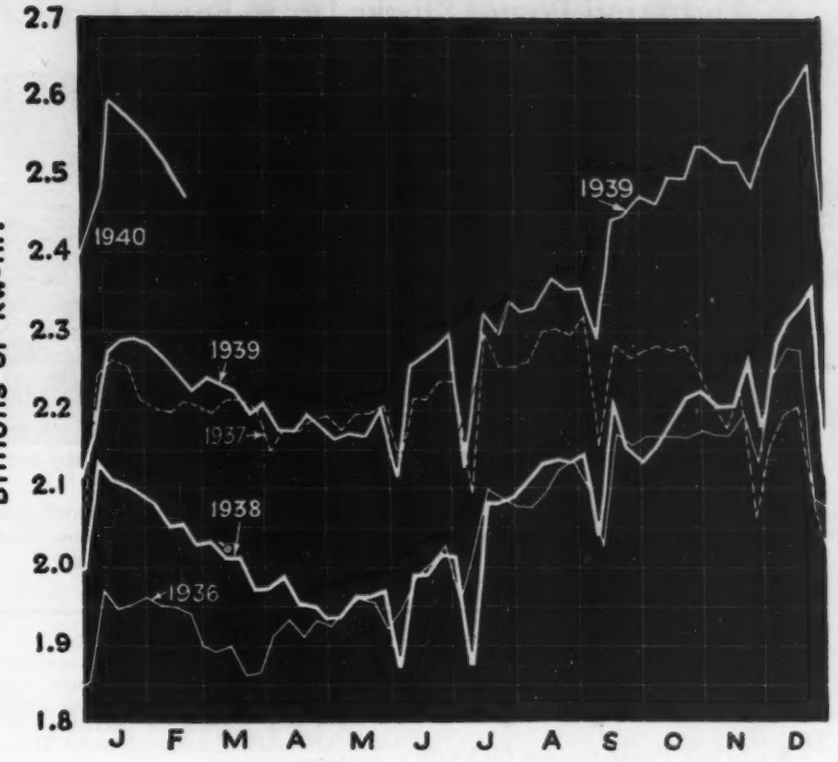
Reduces Utility Taxes

The Michigan State Tax Commission has announced a reduction of 15 cents per $1,000 valuation in the tax public utilities must pay into the primary school fund. Melvin B. McPherson, commission chairman, said it was the first reduction since 1936. The tax on utilities is based on the average property tax rate of Michigan communities. The 1939 rate is $27.4909 per $1,000 valuation.

Output Continues to Set New Records

Energy output of the electric light and power industry remains on a higher level than ever before at this season of the year, amounting to 2,475,574,000 kw.-hr. during the week ended February 17, according to the Edison Electric Institute. While this indicates a decline of 1.9 per cent compared with the preceding week, and therefore a continuation of the downward trend that is to be expected at this period, it was a gain of 10.1 per cent over the previous record for the week, registered a year ago, and of more than 20 per cent over 1938.

The rate of increase over 1939 is, however, becoming narrower. This is true also compared with earlier years—the excess over 1937, which recently was 15.8 per cent, is now 11.9 per cent; the corresponding excess over 1938, recently over 22 per cent, is 20.2 per cent.



Weekly Output Millions Kw.Hr.

1940		1939		1937*	
Feb. 17	2,476	Feb. 18	2,249	Feb. 20	2,212
Feb. 10	2,523	Feb. 11	2,268	Feb. 13	2,200
Feb. 3	2,541	Feb. 4	2,287	Feb. 6	2,201
Jan. 27	2,566	Jan. 28	2,293	Jan. 30	2,215
Jan. 20	2,572	Jan. 21	2,290	Jan. 23	2,257
Jan. 13	2,593	Jan. 14	2,270	Jan. 16	2,264

*1937 was high year prior to 1939.

Per Cent Change from Previous Year

	Week Ending		
	Feb. 17	Feb. 10	Feb. 3
New England	+ 5.2	+ 8.0	+ 8.3
Middle Atlantic	+ 7.2	+ 8.3	+ 7.0
Central Industrial	+12.9	+15.3	+14.5
West Central	+ 9.9	+12.4	+10.8
Southern States	+11.2	+13.1	+13.9
Rocky Mountain	+15.1	+16.5	+22.5
Pacific	+ 7.4	+ 4.7	+ 6.6
United States	+10.1	+11.2	+11.1

Reduced gains over 1939 in the regions most severely affected by the week's storms point to the probability that the reduction in output was due at least in part to the resulting interference with industrial operations.

Output in 1939 Far Above Former Record

Energy production in the United States reached an all-time high mark of 130,271,000,000 kw.-hr. in 1939, according to a preliminary estimate by the Federal Power Commission. This was about 12 per cent more than was produced in 1938. Of the total approximately 127,989,000,000 kw.-hr. were produced for public use as compared with 114,207,000,000 kw.-hr. in the preceding year. The remainder was generated in electric railroad, railway and other plants.

Hydro-electric production declined 2 per cent from 1938 to 43,995,000,000 kw.-hr., and constituted 34 per cent of the total, against an average of 35.8 per cent for the 20-year period from 1920 to 1939.

With the increase in output, combined with low water at many hydro plants, fuel consumption was the largest reported. Coal consumption was 46,225,000 tons, or 15 per cent more than in 1938; oil, 17,342,000 barrels, up 33 per cent; gas, 192,152,000,000 cu ft., up 13 per cent.

The total installed capacity of generating plants as of December 31 was 40,294,000 kw., showing a net increase during the year of 3.2 per cent. As was mentioned above, railway and other plants are included in these statistics, as well as those for electric light and power.

•

Santee-Cooper License Amended by FPC Ruling

Federal Power Commission has granted the application of the South Carolina Public Service Authority, filed December 8, 1939, for amendment of its license for the Santee-Cooper project to provide for the flooding of 1,275 acres of United States lands within the Francis Marion National Forest and the construction and maintenance of dikes and other necessary structures.

The commission has also granted the application filed January 15, 1940, by the authority, licensee for the Santee-Cooper project No. 199, for exemption from payment of annual charges for the period April 1 to and including December 31, 1939, on the ground (among others) that the project is still under construction and no electric energy has been generated.

Denison Dam Case

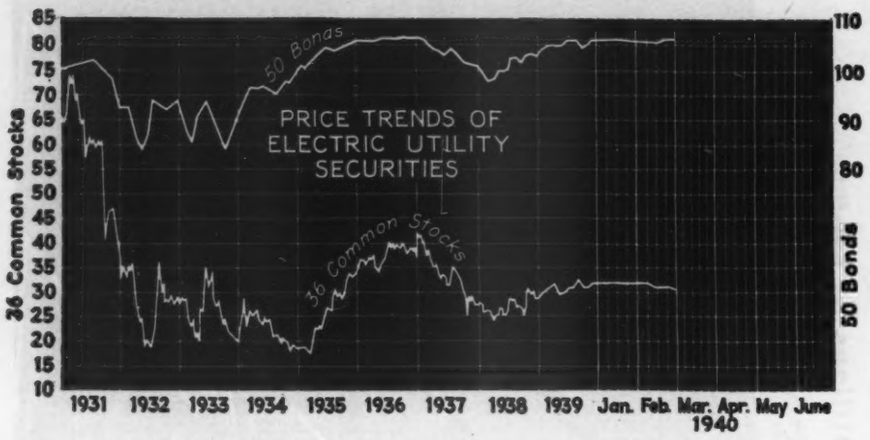
The failure of the United States Supreme Court to permit the state of Oklahoma to file an injunction suit against Secretary of War Harry Woodring to stop construction of the $48,000,000 Denison Dam on the Red River left unanswered questions relating to the 1938 Flood Control Act. It was stated (ELECTRICAL WORLD, February 17, 1940, page 5) that the order, by an evenly divided court, in effect upheld validity of the act. Advice has been received that no such legal interpretation can be made.

•

Greek Hydro Plant

The Greek government has signed a $10,000,000 contract with a group of American firms for the construction of a 76,000-hp. hydro-electric plant and chemical metallurgical plants on the Achelous River, according to reports from Athens. The American company, known as the Hellenic Hydro-Electric & Metallurgical Corp., is affiliated with Hugh L. Cooper & Co., Inc., and the Chemical Construction Co. of New York.

Light and Power Stocks Drop; Bonds Firm


PRICE TRENDS OF
ELECTRIC UTILITY
SECURITIES
50 Bonds
36 Common Stocks
36 Common Stocks
50 Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1931 1932 1933 1934 1935 1936 1937 1938 1939 Jan. Feb. Mar. Apr. May June 1940

Electric light and power stocks declined during the past week. "Electrical World" index moved downward to 31.6, last week, 32.0; last year, 30.8. Utility bonds were steady and held their ground, "Electrical World" index remaining unchanged at 106.2.

Utilities Register Financing Programs

West Penn Power Co. has filed with the SEC an application under the holding company act for exemption from the requirement of filing a declaration in connection with the issuance and sale of $5,000,000 of 3 per cent first mortgage bonds and 24,923 shares of 4½ per cent cumulative preferred stock, $100 par value. Proceeds are to be applied toward improvements, additions and betterments to the company's property, the total cost of which is estimated to be in excess of $7,600,000. The improvement program includes expenditures in connection with increasing the generating capacity of the company's Windsor power station by the addition of a proposed 60,000 kw. unit, together with additional substation and transmission facilities.

Central Illinois Light Co. has filed an application for exemption from the requirement of filing a declaration in connection with a proposal to reduce the interest rate on its first and consolidated mortgage bonds, series due 1963, from 4¼ per cent to 3¼ per cent.

Kentucky Utilities Co., a subsidiary of the Middle West Corp., in an amendment to its registration statement filed recently with the SEC substantially revised the details of its proposed financing. According to the amendment, the company will offer $20,000,000 of first-mortgage 4 per cent bonds due on January 1, 1970, and $6,000,000 of junior mortgage bonds, to be called 4½ per cent sinking-fund mortgage bonds, due on February 1, 1955. An additional $6,000,000 will be raised by the company by bank loans. Originally, the company had planned to issue $26,000,000 of first-mortgage bonds due 1970 and $6,000,000 of serial debentures due 1941 to 1947.

Eastern Shore Public Service Co. of Delaware has been authorized to sell to Chase National Bank a two-year 3 per cent note for $1,000,000 to be secured by $1,100,000 principal amount of the company's first mortgage and first lien bonds, 5 per cent, Series C, due 1946. Proceeds will be used in several refunding operations. SEC also authorized Eastern Shore to acquire $1,750,000 first mortgage 4 per cent bonds, due 1969, Delmarva Power Co., a subsidiary, $2,142,500 first mortgage 4 per cent bonds, due 1969, and 2,855 shares of common stock of Eastern Shore Public Service Co. of Maryland and $1,372,500 first mortgage 4 per cent bonds, due 1969, of Eastern Shore Public Service Co. of Virginia.

Public Service Co. of Oklahoma has filed a declaration covering the issuance of $1,000,000 of 1¾ per cent-2¾ per cent unsecured serial notes. The notes are to be sold privately.

•

Niagara Hudson Merger

In order to carry out a construction program of $150,000,000 during the next ten years, five principal electric and gas operating companies of the Niagara Hudson System have filed with the Public Service Commission a petition for consolidation in an additional step toward the further simplification of the corporate structure of the system (ELECTRICAL WORLD, February 3, 1940, page 20).

•

Standard Trustee Sues

Daniel O. Hastings, a special trustee of the Standard Gas & Electric Co., has brought suit in the New York Supreme Court to recover upward of $44,000,000 in corporate funds alleged to have been diverted illegally to the defendants, wasted or wrongfully paid out between 1923 and 1933. The defendants in the action are H. M. Byllesby & Co., Ladenburg, Thalman & Co., six other corporations and 32 individuals and the estates of five deceased individuals. The defendants claim the trustee is not empowered to sue outside the state of Delaware.

•

New Utility Issues Total $32,550,000

A financing program involving the issuance and sale of $24,800,000 in bonds, preferred stock and a subscription for common stock by the Southwestern Gas & Electric Co., a unit in the Middle West Corp. system, was launched last week. The offering consisted of $16,000,000 of the company's first mortgage 3¼ per cent bonds due on February 1, 1970, and concurrently the company offered 75,000 shares of 5 per cent preferred stock to holders of its outstanding 7 per cent preferred stock under a plan of exchange underwritten by the bankers.

As part of the financing the Middle West Corp., as parent, has subscribed for such number of shares of Southwestern Gas & Electric as the SEC will permit to be issued for the sum of $1,300,000. The number, however, is not to exceed 71,000. The first mortgage bonds are priced at 103 and interest from February 1. The offering price of the preferred is $103 a share, plus dividends from January 1.

In order to refund its entire outstanding funded indebtedness and obtain new money for development, the Marion-Reserve Power Co. entered the market last week with the offering of $7,750,000 of first mortgage 3½ per cent bonds due February 1, 1960 and 7,500 shares of its $5 cumulative preferred stock.

•

Philadelphia Co. Meeting

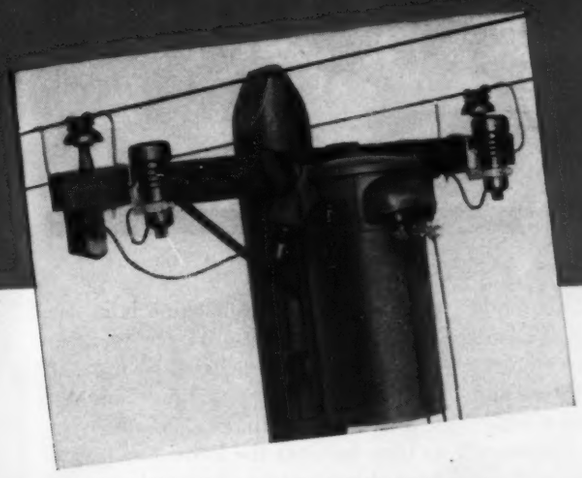
Stockholders of Philadelphia Co. will vote on March 12, at an adjourned special meeting, on proposals for restatement of capital and increase in authorized indebtedness.

Utility Reports

	Net Income 1939	1938
*American Gas & Electric and subs	$13,358,672	$12,130,316
*Arkansas Power & Light	1,275,153	1,317,440
*Birmingham Electric	624,492	565,371
*Cons. Gas, Elec. Lt. & Pwr. (Balti.)	6,805,831	5,853,140
*Minnesota Power & Light	1,374,081	1,112,327
*Nebraska Power	1,782,711	1,897,268
*Oklahoma Gas & Electric	2,778,505	2,344,748
*Southern Calif. Edison	12,701,916	11,733,479
*Superior Water, Light & Power	120,121	101,666
*Virginia Public Service	1,067,616	683,078
*Washington Water Power	3,041,658	2,488,647
	1940	1939
†Bangor Hydro-Electric	682,433	697,139

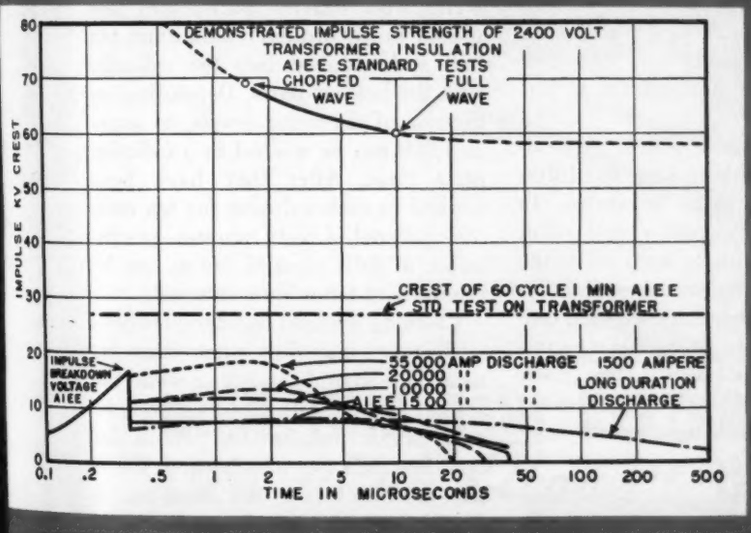
*Twelve months ended December 31.
†Twelve months ended January 31.

GIVE YOU Better Protection



Pellet arresters protecting G-E Type HBA distribution transformer (above) and G-E standard Type H transformer (left)

3. They Don't SKIMP on Protection



For example, compare the volt-time oscillograms for the 3-kv pellet arrester with the volt-time impulse strength of a modern 2400-volt distribution transformer—

The exceptionally low impulse breakdown voltage of the pellet arrester starts discharge at a voltage *far below* the impulse test strength of a new transformer. And whether small, medium or large lightning currents are discharged, the unusually low IR characteristic of pellet arresters similarly limits the lightning voltage—providing an *enormous* margin of protection.

In fact, the 3-kv pellet arrester impulse protection level is even below the 60-cycle 1-minute crest test voltage of modern 2400-volt distribution transformers.

4. They Have VALVE Action

This valve action

(a) prevents the development of system short-circuits or power arcing attending discharge;

(b) makes the protection universally applicable to any part of the system, urban or rural, regardless of feeder short-circuit current;

(c) assures that the protection itself is not limited by the cumulative damaging influences of power arcs;

(d) provides the highest service continuity with no interference to fuse co-ordination or fusing practice;

(e) minimizes the possibility of primary power reaching secondary circuits.

And That's Why with Pellet Arrester Protection —

(a) You avoid repeated stresses close to the transformer strength;

(b) You have plenty of margin of protection, even assuming considerable depreciation of transformer insulation with years of service;

(c) You get excellent protection for your *old* transformers as well as for new ones;

(d) You can expect the maximum life of your transformers.

Select your G-E Pellet Arresters from Bulletin GEA-2975.

GENERAL ELECTRIC

OPERATING PRACTICES

Electric Washer Cleans Meter Parts

By A. C. MORRISON
Superintendent Meter Department
Duke Power Company, Charlotte, N. C.

While the torque on the modern watt-hour meter is practically the same as on the meter of a few years ago, the various devices that have been added have placed a heavier load on the moving element that drives them. Consequently, a small amount of dirt or gum can cause considerable error.

This means that registers, devices, jewels and bearings must be cleaned more frequently; since the number of parts has been increased from six to seven times, the cleaning job becomes a major problem for the meter laboratory.

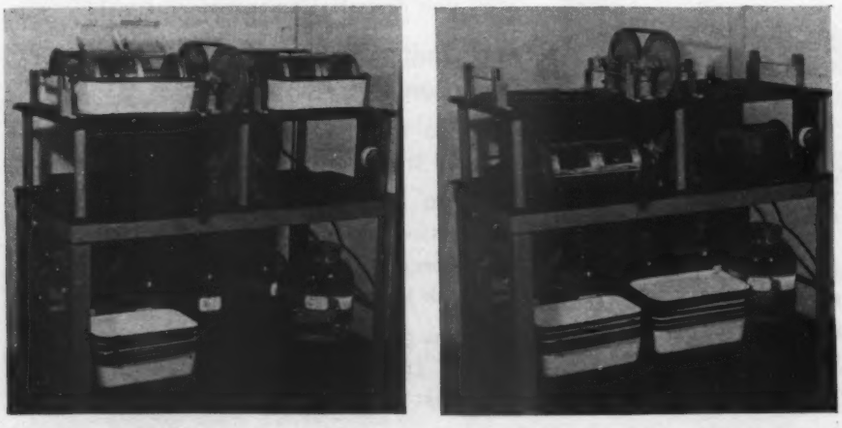
To solve this problem we have designed and built our own washer, of sufficient size to accomplish a thorough job. With its four washing cylinders, this machine will hold four solutions; thus any desired combination of washing and rinsing stages may be secured. Since the cylinders are all the same size—8 in. long and 5 in. in diameter—and fitted alike, they can easily be lifted from one stage to another, or be removed for filling or emptying.

The cylinders are driven at a speed of 75 r.p.m. by a single-phase, ¼-hp., 1,750-r.p.m. motor through a series of V-belts and reduction pulleys. This speed is sufficiently slow so that the articles tumble gently with each revolution and also slow enough to prevent splashing.

In cleaning meter jewels or bearings, it is desirable to keep the different makes and types separated. In cleaning meter registers and other parts it is desirable to keep all of the parts of one register together. So the washing cylinders are divided into two compartments, providing a capacity of eight registers at a time. Each compartment has an individual door with a positive locking device to keep it closed when the machine is in use. Porcelain-covered refrigerator crisper pans hold the cleaning solutions, slots in the pans fitting over the shafts of the cylinders. Another pan is inverted over the lower one to prevent objectionable odors and evaporation. Socket arrangements on each end of the four shafts engage dogs on the end of each washing cylinder.

If delicate parts are to be cleaned along with heavier parts, they are placed in an ordinary aluminum tea ball and dropped into the cylinder with the heavier parts. Depending on the size of the meter jewels, as many as 1,000 can be washed in a cylinder at a time. After they have been washed in each solution for ten minutes—a total of forty minutes—a container of fully cleaned jewels can be removed at ten-minute intervals.

Cleaning demand registers has been a slow two-man job when done by hand, one man dismantling while the second cleans. With this machine one man can accomplish the job in far less time than two men needed. While the machine does the washing, a single operator can dismantle registers sufficiently fast to keep ahead of it.



SINGLE OPERATOR can clean 20,000 meter jewels a day using this electric washer. Meter parts are locked inside the two compartments in each of the four washing cylinders, which then are covered with the refrigerator crisper pans (left). Storage space is provided for the cleaning liquids and for various accessories when the machine is not in use (right)

•

Common Data on Neutral Operation

By R. A. SWITZER *
Wisconsin Gas & Electric Company

Common neutral systems have been in operation in Wisconsin for more than ten years, the first ones having been installed in the cities of Eau Claire and La Crosse. In 1932 the Wisconsin Electric Power Company

*Abstract of paper Wisconsin Utilities Association.

It's Amazing...

HOW THIS NEW DELTABESTON RESISTOR CABLE CAN "Rub Elbows" WITH HOT RESISTORS

Yes—"rub elbows" with hot resistors and laugh at the heat—that's the job for which this G-E Deltabeston Resistor Cable was designed. That specifically.

It's amazing, all right—until you understand the reasons. Take, for example, the Flamenol tape wrap over that tinned copper conductor. Flamenol is a "bear for punishment" when it comes to protection from heat.

Look at the next wrap—purified Asbestos (by the exclusive Deltabeston Purification Process) felted around the tape and then impregnated with a flame-, heat-, and moisture-resisting compound.

Over this a closely woven purified asbestos braid with a heat- and moisture-resisting finish—a finish carefully applied and then wiped to give a smooth, uniform exterior coating.

IT'S NOT AMAZING, THEN—NOT IF YOU UNDERSTAND HOW DELTABESTON RESISTOR CABLE IS MADE. And don't forget that it laughs at moisture the same way it laughs at heat. YOU NEED IT ON YOUR CONTROL BOARDS.

Use the coupon to get a sample and catalog information on this New G-E Deltabeston Resistor Cable. We'll take care of you in a hurry.

GENERAL ELECTRIC

Deltabeston Wires and Cables are distributed by all G-E Merchandise Distributors and by Graybar Electric Co.

Section Y-0132, Appliance & Merchandise Department, General Electric Company, Bridgeport, Conn.

Send me a sample and catalog on the New Deltabeston Resistor Cable.

Name.....

Address.....

City..... State.....

Data on Common Neutral Systems

	Eau Claire		La Crosse	
	Urban	Rural	Urban	Rural
Miles of three-phase, 2,300/4,000 Y	21.3	1.3	29.0	2.7
Miles of one-phase, 2,300 volt	30.1	7.5	42.0	7.0
Transformers connected	514	45	598	49
Transformer protection				
Lightning arresters, per cent	95	25	95	25
Fuses, per cent	100	100	100	100
Gaps	None	None	None	None
Oil circuit breakers	At substations only		At substations only	
Grounds				
Kind	Driven rods		Driven rods	
Size	⅝" x 10'		¾" x 60' average*	
Number existing per transformer	Approximately 2		Approximately 2	
Number installed for new construction per transformer	One		One	
Resistance before interconnection	Not measured		13 ohms average	
Resistance after interconnection	Not measured		1.9 ohms average	
Fuses blown during 1938				
Due to lightning	24		43	
Due to other causes	29		44	

* Certain pipe grounds at La Crosse are driven to a depth of 90 ft.

converted one city feeder over to common neutral operation on an experimental basis and has since converted six additional feeders to common neutral. Since 1936 several thousand miles of new common neutral rural lines have been built and old lines converted in the state.

The accompanying data on the Eau Claire and La Crosse systems, while not comparative, give an indication of what may be expected in the operation of urban common neutral systems.

A comparison of the 1938 transformer outage operating records of five common neutral feeders and eleven isolated neutral feeders serving adjacent and similar areas on the Milwaukee system shows the following:

2,200/3,810-Volt Feeders	Number of Transformers	Number of Outages	Per Cent
5 common neutral.	485	12	2.47
11 isolated neutral.	1063	40	3.76

Common neutral systems, if properly balanced, cause no undue interference with communication facilities. No interference problems have arisen due to the Eau Claire, La Crosse or Milwaukee common neutral systems. Some difficulty has been experienced on rural telephone lines due to unbalanced loads or wire mileage of power distribution systems. However, probably as much interference has been due to poorly maintained telephone lines.

It is advisable to balance the distribution system. This consists of endeavoring to obtain an equal mileage of wire and load on each phase of the system. Long single-phase taps present the biggest problem, but by making a complete study of each individual feeder it is generally possible to arrive at a satisfactory solution. The unbalanced portions of three-phase feeders should be held to a minimum also.

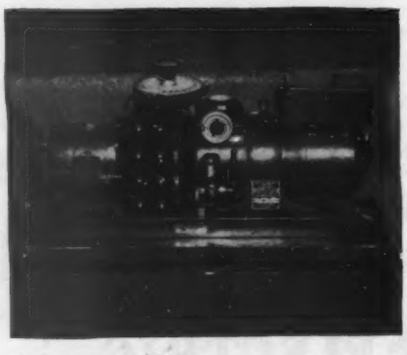
•

Moble Frequency Set Built for $200

It is axiomatic that a good source of variable frequency a.c. for frequency relay and frequency meter tests is seldom found in remote substations and outlying portions of any utility system. To meet the need, therefore, engineers of the Iowa Electric Light & Power Company, Cedar Rapids, assembled a variable frequency set at a cost of about $200 which has the advantages of being readily portable, compact and of a weight which, though not light, is readily transferrable by two men.

Shown in the accompanying illustration, the set consists of a ⅓-hp., 110-volt, capacitor-type New Departure "Transitorque" motor capable of continuous speed adjustment between 560 and 5,600 r.p.m. The motor drives a 110-watt a.c. self-excited generator which delivers 110 volts, 60 cycles at 3,600 r.p.m. This set is usually operated at a speed of 3,300 to 3,900, corresponding to frequencies from 55 to 65 cycles per second.

When being transported around the system the set is housed in a box 35 in. long, 14 in. high and 13 in. wide. The assembly weighs 186 lb.



COMPACT set provides variable frequency for relay and meter tests

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Transmission Line Interference Cures—II*

By J. C. FEAR
Northern States Power Company

The effect of the substitution of wood for steel, where feasible, in reducing interference on high-voltage transmission lines was demonstrated in a recent study. On 11,000-volt grounded-neutral lines of four-wire construction on long wooden crossarms, with insulators mounted on wooden pins and with no pole ground wires except for a few neutral grounds in favorable spots, we found the noise level was one unit. On a line of more modern construction—three wires on wood crossarms, with the fourth (neutral) a steel cable carried on bayonets and grounded at every pole with No. 4 galvanized iron wire and insulators mounted on steel pins—the noise level rose to 20 units.

Single-phase branches from this second line, constructed on wooden crossarms, with insulators mounted on wood pins and no pole ground wires, have a noise level of 20 units at the main line; within a mile, the noise level drops to less than one unit. Other single-phase branches, of practically the same construction except for insulators mounted on steel pins, show a noise level of ten to twelve units.

On 33,000-volt lines the two-unit, suspension-type-insulated lines have a noise level of less than one unit, whereas the pin-type average about 40 units. While we have never made any comparison of wood versus steel pins on this voltage, I believe a nonmetallic pin would greatly reduce noise levels.

In comparing 69,000-volt lines I found that the five-unit, suspension-type-insulated line, of H-frame wooden construction, has an average noise level of five units. With single-pole construction, the average is ten to fifteen units. Pin-type insulators on

*Adapted from paper presented before Wisconsin Utilities Association.

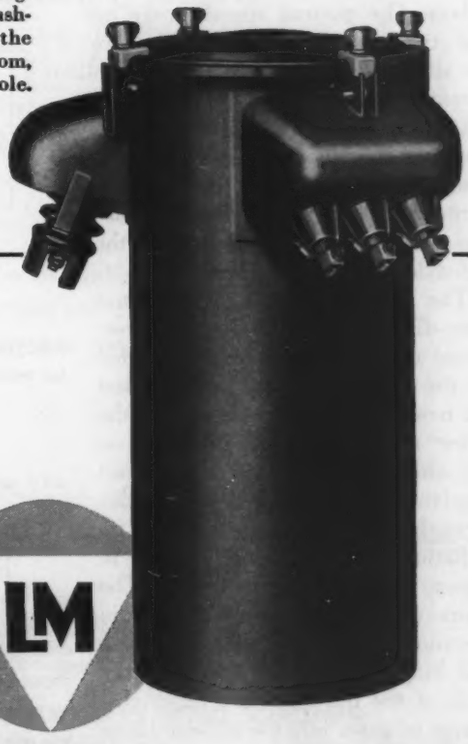
"Bushing Breakage *Used to be* a lot of trouble"

Finally the boss cracked down. Said we were breaking so many transformer bushings in the store room it looked like sabotage. I didn't blame him for his peeve, even though we hadn't been careless.

Next I showed him that the secondary bushings on L-M Transformers are protected by the same type of overhanging pocket. I knew we had the bushing problem licked when the boss said we'd see a lot more L-M Transformers coming in from now on.

I showed the boss just how that overhanging pocket they put on the primary bushings of L-M Transformers protects the bushings from bumps in the store room, on the truck, and going up the pole.

r the boss gave us a fancy going over I ted out to him that we didn't have broken bushing trouble with L-M sformers. He got interested right away.



Those overhanging pockets on L-M Transformers do a great deal more than make the bushings safe from bumps. They are one of the big reasons why rain, snow and sleet don't get inside L-M Transformer tanks. As a matter of fact, these L-M overhanging pockets prevent rain and snow from even getting near the gaskets, where moisture seepage is most likely to occur. Important, too, are the greater clearances inside L-M tanks made possible by recessing the bushings in the overhanging pockets. And, if repairs should ever become necessary, you can lift the L-M core and coil assembly right out of the tank without removing the bushings . . . recessed in the overhanging pockets, L-M bushings are never in the way.

LINE MATERIAL CO.

the older lines, mounted on medium-length crossarms, with static wire on bayonet and ground wire stapled on every pole, have a noise level of 800 to 1,000 units. Later construction, single-pole, long crossarms, wood crossarm braces, pin-type insulators on steel pins, static wire carried on pole top and ground wire carried down between the phases and fastened under ground molding without staples, had a noise level of about 100 units.

•

Electrical Changes in Topped Plant

By W. V. DRAKE
Manager of Power Generation
Monongahela West Penn Public Service Company,
Fairmont, W. Va.

Incidental to installation of superposed turbine extensive changes in the protective features were incorporated in the electrical layout of the enlarged Rivesville station of the Monongahela West Penn Public Service Company.* The new generator, the new step-up transformer bank and the new 2,300-volt auxiliary transformers each has independent differential protection. In addition there is shown the over-all protection of the new 11-kv. metal-clad switch structure, provided by four separate sets of current transformers connected to three-element differential relays. The current transformers on the two transformer breakers are paralleled because four-element differential relays were not available when this feature of the layout was designed. Incidentally, the new metal-clad equipment shows to great advantage in this station, where there was a very large installation of the old-style concrete electrical cells.

The old 11-kv. main bus did not have differential protection, so directional overload relays were installed on the tie between the old bus and the new generator, to disconnect the latter rapidly in case of fault on the old bus. An interesting detail involved in running the tie bus through the control room is an installation of "explosion" doors to prevent spreading of bus trouble. The doors on the bus compartments in this room are bolted solidly in place, and hinged aluminum doors in the back of the bus structure allow discharge of gases into the turbine room at a point isolated from the bus.

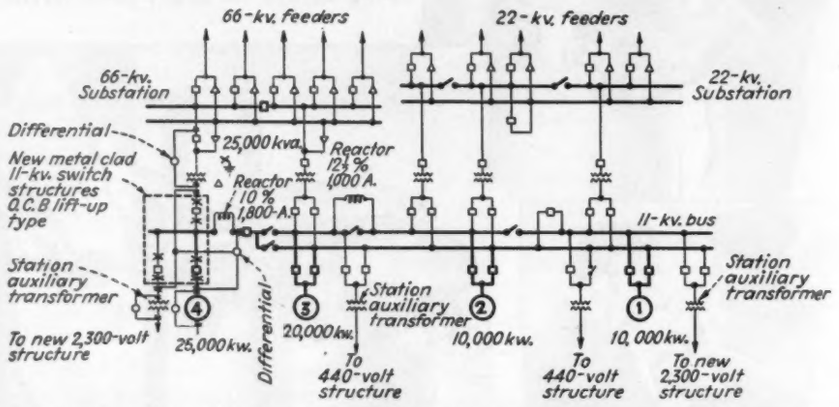
The diagram of the 2,300-volt circuits shows the two bus sections which are normally operated independently, with the sectionalizing breaker open. If voltage fails on either section, automatic relays trip the faulty supply circuit and close the sectionalizing breaker, insuring against shutdown of the motor-driven auxiliaries on the de-energized section. If failure of voltage on one bus section results from a fault thereon, additional relays operated by overcurrent lock out the above-mentioned automatic transfer equipment and isolate the faulty bus section.

*See page 34.

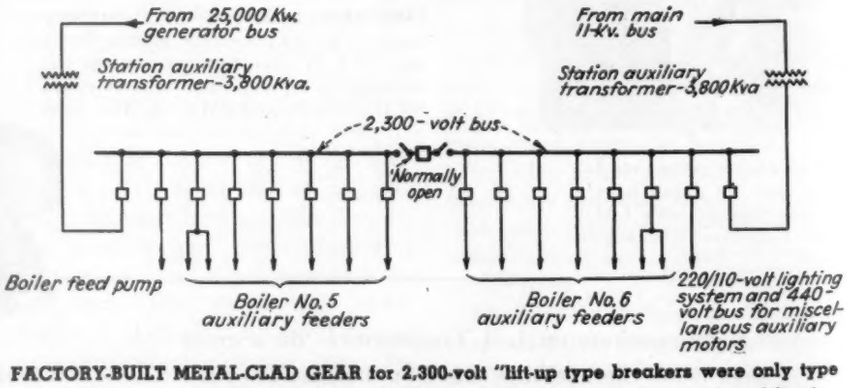
Cost of Demand Meter on a 13-Kv. Feeder

To install a demand meter outdoors on a 13-kv. feeder near a substation cost an Eastern utility $749.01, according to its capital additions record. Itemized, the job was broken down as follows:

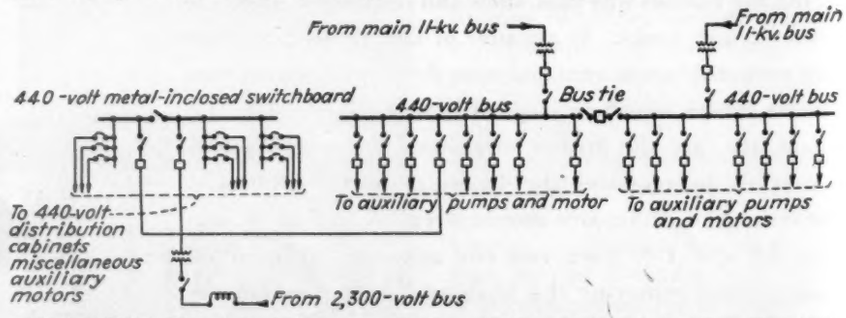
Labor	$68.87
Liability insurance and payroll tax	0.33
Transportation and traveling	35.10
Two 100-amp. current transformers	174.81
Two 13.8-kv. potential transformers	253.93
One demand meter	110.38
One test block	5.72
One ratchet	1.10
Two lightning protectors	48.76
Engineering	11.83
Miscellaneous	38.16
Total	$749.01



MAIN ELECTRICAL CONNECTION—Additions for new topping unit are the metal-clad structure (left) installed in space available in the switch house, new main and auxiliary transformer banks and ties to the 11-kv. and 66-kv. structures, and bus reactors to protect the old breakers of insufficient interrupting capacity and localize disturbances from 11-kv. short circuits


From 25,000 Kw. generator bus
From main 11-kv. bus
Station auxiliary transformer-3,800 Kva.
Station auxiliary transformer-3,800 Kva.
2,300-volt bus
Normally open
Boiler feed pump
Boiler No. 5 auxiliary feeders
Boiler No. 6 auxiliary feeders
220/110-volt lighting system and 440-volt bus for miscellaneous auxiliary motors

FACTORY-BUILT METAL-CLAD GEAR for 2,300-volt "lift-up type breakers were only type for which space was available in old switch house after minimum structural modification



OLD 440-VOLT BUS retained but sectionalized at middle with bus tie breaker. New feeders are taken from a new metal-inclosed switchboard installed in the switch house basement and fed from both the old 440-volt and 2,300-volt buses

NOT OVER .010 Water Absorption

. . . . WITH DEPROTEINIZED RUBBER

Simplex-ANHYDREX rubber insulation for wires and cables is made with deproteinized rubber. Deproteinized rubber insulation will not absorb more than .010 grams per square inch of exposed surface when soaked for seven days in distilled water at 158°F. ANHYDREX insulation can be trusted over a period of years not to absorb harmful quantities of water when used on submarine or underground cables that are exposed to water.

In our laboratories we learned that insulation made with deproteinized rubber would not absorb harmful quantities of water. Years of field tests confirm the laboratory results. Simplex-ANHYDREX is the first insulation to use deproteinized rubber. It cannot absorb harmful quantities of water and it does retain the electrical and physical qualities that make rubber the most desirable insulation for wires and cables. Simplex-ANHYDREX is the logical choice for submarine cable insulation. It is unexcelled for underground power cables too.

Any cable that may become wet should be insulated with deproteinized rubber insulation. May we send you our recently revised (July, 1939) booklet telling all about this better rubber insulation.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

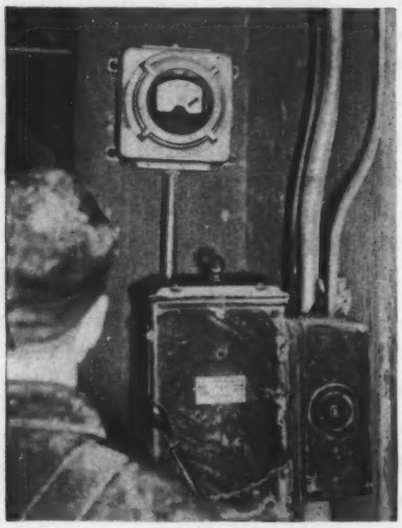
Simplex-ANHYDREX

deproteinized rubber insulation for wires and cables

INDUSTRIAL ENGINEERING

Boost Motor Loading, Better Power Factor

Capacitors, overexcited synchronous motors and the like are not the only answer to the problem of low plant power factor. For plants whose process will permit there is another solution—controlled motor loading by the use of ammeters. This practice requires skill on the part of the plant designer in selecting exactly the proper size motor for each machine, and its success depends upon machine operators' attention to instrument readings. But it will pay dividends in lower power costs and more efficient plant operation. Take the case of a Middle Western soy bean mill.



AMMETERS on induction motors to guide loading. Practice keeps power factor above 80 per cent, avoids investment

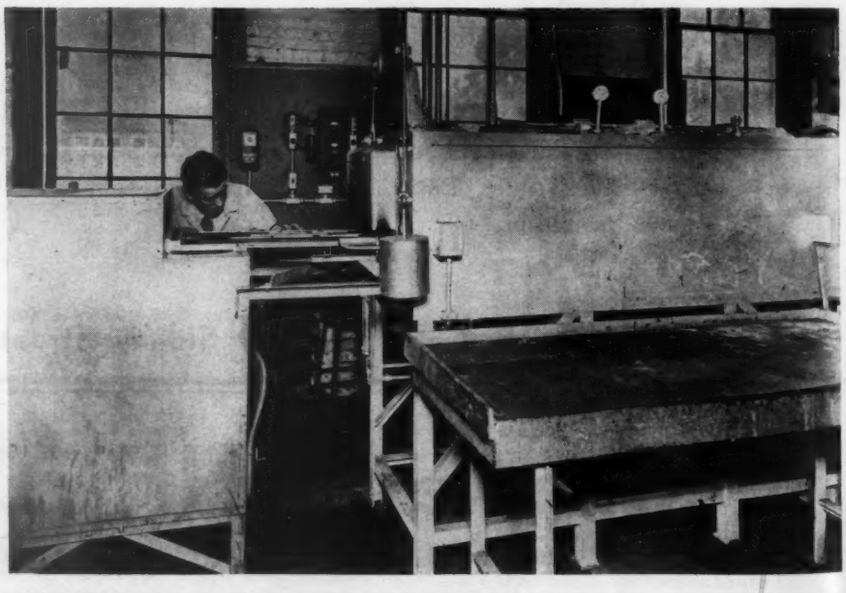
This plant has an electrical load of between 300 and 400 kw., made up largely of some 50–60 induction motors on conveying, cracking, oil-expelling and cake-grinding equipment. Operating on a power rate that provides increased charge for power factor below 80 per cent and awards a premium for above 85 per cent, the plant power factor hangs month after month in the "No man's land" between 80 and 85 per cent. Yet there isn't a condenser or synchronous motor of any size in the plant. However, every induction motor of any size at all has an ammeter in its circuit. Machine operators keep the motors operating at full nameplate rating by varying the rate of feed to the driven machine. With induction motors operating at full load they operate on the crown of their power factor and efficiency curves and the driven machine turns out full design capacity.

The accompanying illustration shows the ammeter for a 60-hp., totally inclosed, fan-cooled induction motor driving a hammer mill that grinds cake (residue after oil has been extracted from soy beans) into feed for cattle. Full load for this motor, 76 amp., corresponding to a machine output of about 12 tons of ground cake per hour, is maintained with the help of the ammeter located near the motor. Because of the dust explosion hazard in the plant a dust-tight housing is provided for the ammeter.

•

Razor Cutter Heads Hardened Electrically

Straight-line production under controlled conditions features a continuous hardening and quenching furnace recently installed at the Stamford, Conn., plant of the Schick Dry Shaver Company. The equipment, designed by the American Electric Furnace Company, Boston, illustrates the convenience of this type of heat treat-



FOUR ROWS of work pass through furnace together

Micabond is an adaptable form of Mica insulation which provides excellent electrical insulating properties under heat and moisture conditions where other materials fail.

How best to use it in your product can be accurately determined thru C-D research and engineering. First let us send you a copy of Micabond Manual M-12 then at your call and without obligation our engineers will be glad to study your particular insulation problem.

ment on a mass production basis, both as to working conditions in the plant and close control of quality output. The work passes from the loading chamber at the left into the furnace chamber, which is 6 ft. long, 12 in. wide and 10 in. high, lined with insulating refractory material, and equipped with 30.3 kw. in electric heating units located on the side walls and under the hearth. Energy is supplied at 230 volts, three phase.

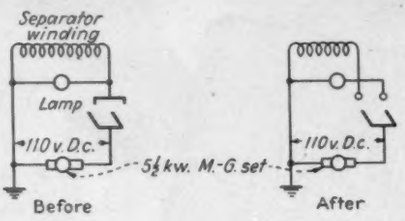
Temperature requirements range from 1,475 to 1,550 deg. F. Internal atmosphere is controlled by a gas curtain and secondary inlets are provided for artificial atmosphere. The cutter heads are moved forward by a cam-operated pusher installation, each row of work being moved forward the length of one block at a time. Each row delivers a block every 90 seconds, and variable-speed motor drives are provided for the main feed of material through the furnace and for quench operation. Electric heating was adopted to insure maximum production and uniformity of results, including the elimination of scale.

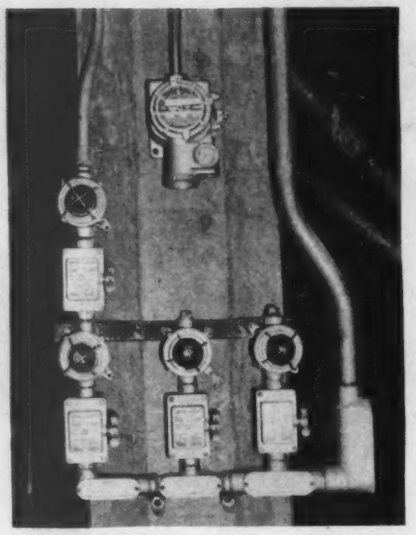
•

Simple Circuit Change Prolongs Lamp Life

When an incandescent indicating lamp is connected directly across the winding of a d.c. solenoid or magnet its life is apt to be shorter than normal unless some step is taken to protect the lamp against the inductive kick of the winding as it is disconnected from its supply.

Such a difficulty was encountered at the Kankakee, Ill., corn mill of General Foods Company with lamps connected across a circuit supplying 110 volts d.c. to magnetic tramp-iron separators.





TWO-POLE SWITCH protects indicating lamp from inductive kick

The problem was solved in a simple manner by using a two-pole switch on the magnet circuit; one blade of the switch broke the separator circuit, while the second pole blade broke the lamp circuit separately as shown. In this way the inductive kick was not transmitted to the lamp.

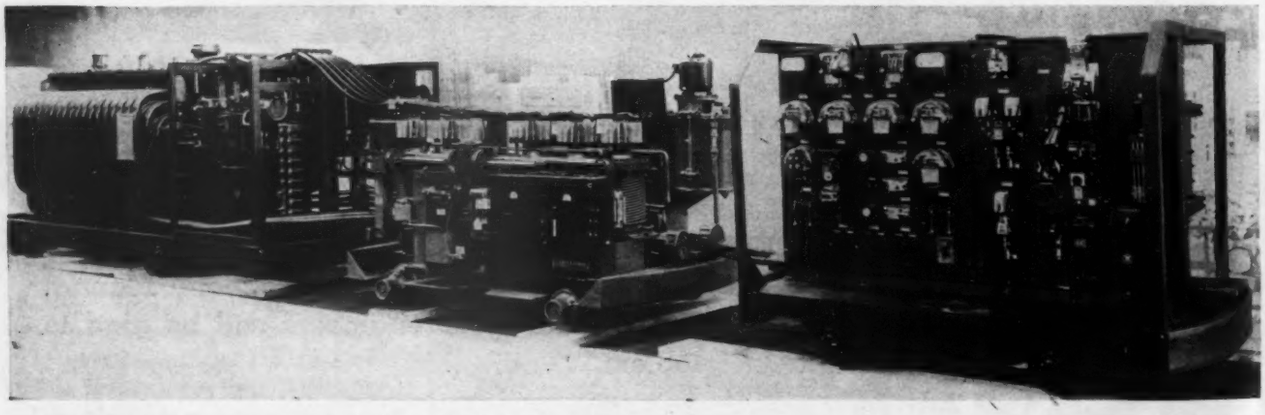
•

Multiple Power-Factor Correction

Power-factor correction at the Pawtucket, R. I., plant of the Collyer Insulated Wire Company is achieved by an effective combination of synchronous motors and capacitors, with a normal value of 92 per cent on a 650-kw. demand. The driving of a 400-lb. Banbury mixer by a 150-hp. motor and of a rubber mill by a 125-hp. motor provided opportunity for synchronous equipment, which, with about 80 kva. in capacitors located in two groups of 70 and 10 kva. rating, respectively, have decidedly improved operating conditions in view of the major induction motor equipment of the plant.

The larger group of capacitor units is automatically cut in and out as the motors in the braiding room are running, these totaling 150 hp. in rating and supplied from a 550-volt, three-phase circuit. These motors range in size from 7.5 to 20 hp. The 10-kva. capacitor is wired in connection with the 20-hp. induction motor driving the plant air compressor. The capacitor mounting in connection with the braiding room motors is on the ceiling of the floor below, with short wiring run to the starting switch equipment of the motor installation. The combination of corrective means works out well under various conditions of departmental loading.

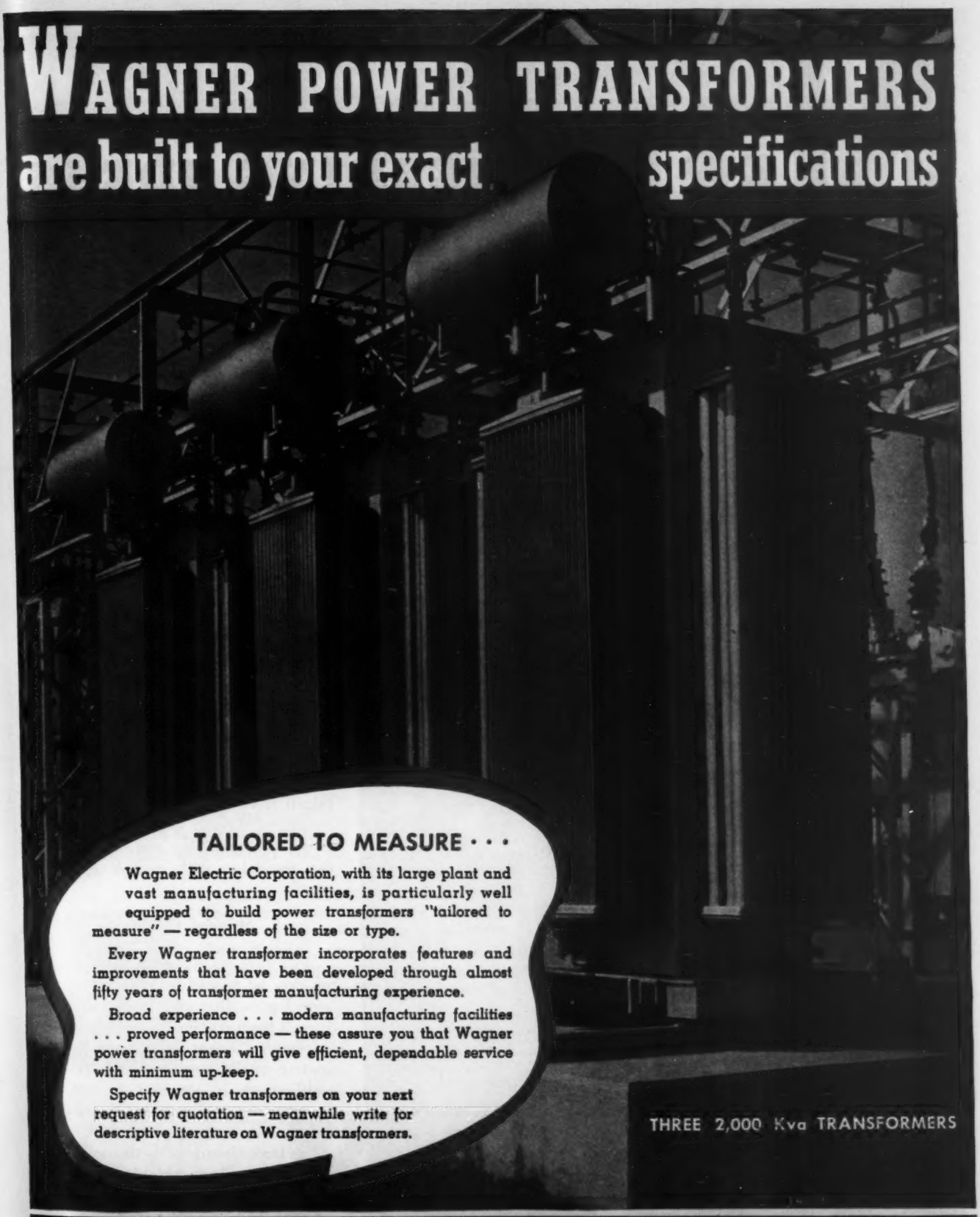
Portable Ignitron Rectifier Substation



Westinghouse Photo

Of thirteen Ignitron rectifier substations, with a total rated capacity of approximately 5,000 kw., installed during 1939 to serve coal mining loads, six are used in surface substations to supply energy at 550 volts and one in a surface station to supply energy at 275 volts. The remaining six stations are portable ones, supplying at 275 volts. The portable, single-anode, six-tank portable substation illustrated is rated at 300 kw., 275 volts, d.c.

WAGNER POWER TRANSFORMERS
are built to your exact specifications



THREE 2,000 Kva TRANSFORMERS

TAILORED TO MEASURE • • •

Wagner Electric Corporation, with its large plant and vast manufacturing facilities, is particularly well equipped to build power transformers "tailored to measure" — regardless of the size or type.

Every Wagner transformer incorporates features and improvements that have been developed through almost fifty years of transformer manufacturing experience.

Broad experience . . . modern manufacturing facilities . . . proved performance — these assure you that Wagner power transformers will give efficient, dependable service with minimum up-keep.

Specify Wagner transformers on your next request for quotation — meanwhile write for descriptive literature on Wagner transformers.

Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

TRANSFORMERS · MOTORS · FANS · BRAKES

NEW ENGINEERING IDEAS

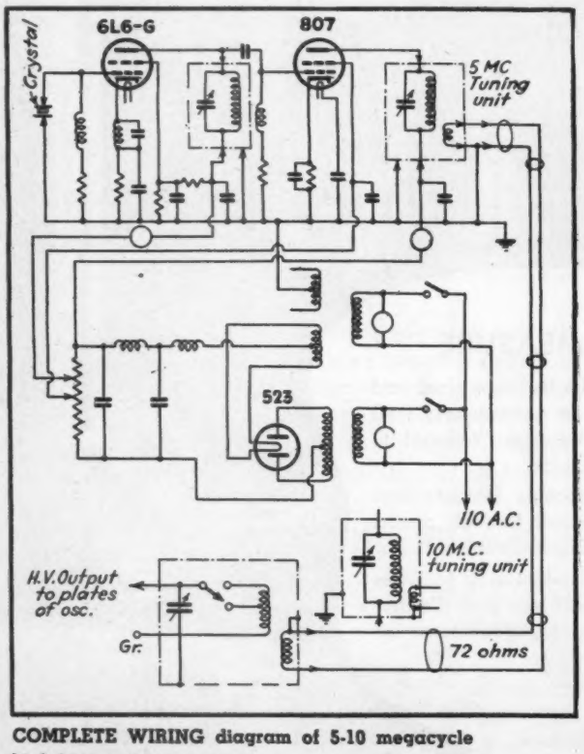
High-Frequency Generator Calibration

By C. J. TIRK and P. H. McAULEY
Central Engineering Laboratories and Standards
Westinghouse Electric & Manufacturing Company

To obtain the time axis of a high-voltage cathode-ray oscillograph the timing voltage is impressed on one set of deflected plates at a definite instant with respect to the voltage or current to be recorded. The voltage drop in the resistor through which a condenser discharges gives this timing voltage and various combinations of resistance and capacity permit changing the timing sweep to cover the range required with standard impulse waves of definite time characteristics.

By applying a continuous wave high-frequency voltage to one set of the oscillograph plates and closing the timing circuit either with a switch or by means of the three-electrode gap a cathode-ray oscillogram of the high-frequency wave is obtained.

Westinghouse cathode-ray oscillographs are equipped with an oscillator which gives 500 and 1,000 kilocycles for timing calibrations. Experience has indicated that the timing system is remarkably consistent and occasional check calibrations suffice. One cycle of a 1,000-kilocycle wave is 1 microsecond and for timing sweeps of 1 microsecond or less a portable 5- and 10-megacycle oscillator has been developed.



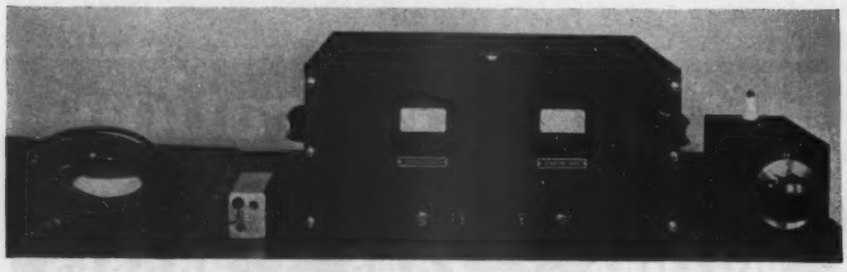
COMPLETE WIRING diagram of 5-10 megacycle high-frequency generator

By means of capacity coupling a 5-megacycle crystal oscillator with a type 6L6G tube drives a single-ended amplifier stage containing one 807 tube. A considerable second harmonic is obtained from the 807 tube so that by inserting a resonant circuit in the amplifier tank circuit tuned to this harmonic the amplifier stage can be used as a frequency doubler to supply voltage at 10 megacycles. The output voltage is obtained from a separate tuned circuit connected directly across the oscillograph timing plates and coupled to the oscillator with a link-coupling circuit.

Shielded Circuits

With this arrangement the oscillator can be placed at some distance from the oscillograph. Cable used to connect the inductive links is a twisted pair with 72-ohm surge impedance. Control of the output voltage at the oscillograph is obtained by tuning the variable condenser in the output tank circuit.

The tank circuits of both oscillator and amplifier are shielded in aluminum cans to eliminate interstage coupling and prevent parasitic oscillations. To change from 5 to 10 megacycles the amplifier tank circuit is removed and the 10-megacycle circuit is plugged in. The tap on the tuning unit at the oscillograph plates is changed with a toggle switch and the condenser is retuned for the required voltage at 10 megacycles.



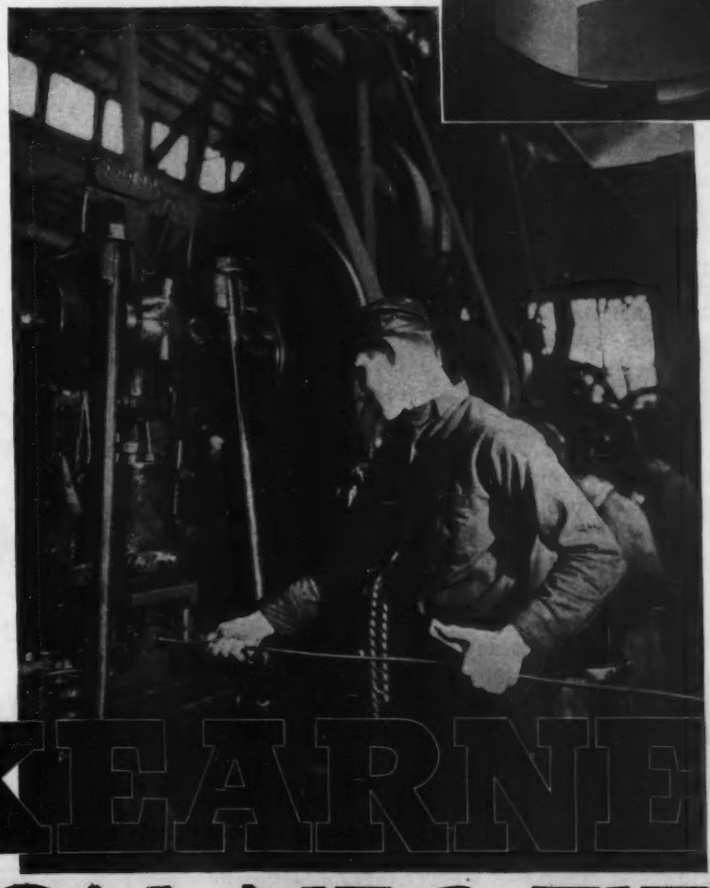
TOTAL WEIGHT of generator is only 46 lb.

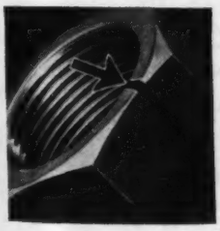
READ HERE—HOW KEARNEY CON-NEC-TITES ARE MADE BY A SPECIAL PROCESS TO AVOID SEAM CRACKS

A HIDDEN seam crack in the nut of a solderless wire connector, after it has long been in service, and expansion and contraction has set in, might develop into a definite split and become a source of costly trouble. But seam cracks in Kearney Con-Nec-Tites have been avoided and minimized by study and research conducted years ago when the Kearney Corporation alone was pioneering the use and advantages of this method of making good electrical connections, without hazardous use of solder.

An initial step to avoid seam cracks was to conduct a metallurgical survey to determine best materials for strength and lasting qualities. The next step was to develop a special exclusive process of fabricating rod stock into Con-Nec-Tite nuts — a process that requires three separate conditioning operations. A third step was the establishment of rigid inspection methods to catch seam cracks before they appeared in Con-Nec-Tites.

Naturally, these extra manufacturing precautions placed added costs on production of Kearney Con-Nec-Tites — but streamline manufacturing methods and large volumes have offset these costs and enables you to get extra value, at no greater cost.





Operating men who have used Kearney Con-Nec-Tites for years will tell you that it pays to use Kearney quality to obtain greater line security.

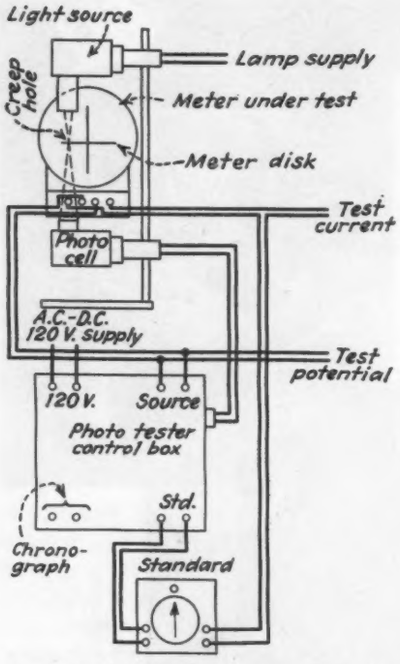
Use KEARNEY CON-NEC-TITES

MADE BY THE JAMES R. KEARNEY CORPORATION
4224-42 CLAYTON AVE. • ST. LOUIS, MO. • *Canadian Office*, TORONTO, CANADA

Photo Tester for Watt-hour Meters

Developed as an aid to faster and more accurate watt-hour meter testing, a new automatic device employs a photo-electric tube and relays to count the revolutions of a meter under test and to start and stop the rotating standard in accordance with the revolutions.

In testing a watt-hour meter with



SCHEMATIC DIAGRAM of set-up for testing watt-hour meters with photo-electric tester

this device a concentrated beam of light is focussed on the meter disk. Twice each revolution the light shines through the creep holes in the disk onto the photo-tube. An amplifier relay unit in the control box opens and closes the potential circuit of the rotating standard in accordance with the predetermined revolutions of the meter, which are set by the position of the selector switch on the control box. To eliminate any time variations which might occur in starting and stopping the rotating standard two relays are used to open and close the circuit. For polyphase meters of the "V" type, which do not have creep holes, a small mirror is attached to the rotating shaft.

Tests made with this instrument in the General Electric meter laboratory indicate that its accuracy is such that the running time of the test may be cut in half and repeat runs are unnecessary.

Other uses suggested for the new photo-electric tester include checking the accuracy of rotating standards by the primary standard method, starting and stopping meters in gang testing, for which an auxiliary relay is required, and testing watt-hour meters by the synchronous clock method. Terminals are provided so that a chronograph or similar device may be actuated by the impulse of current obtained by the light falling on the photo-tube.

•

New Single-Anode Mercury Rectifier

By O. K. MARTI
Engineer in Charge Rectifier Division, Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

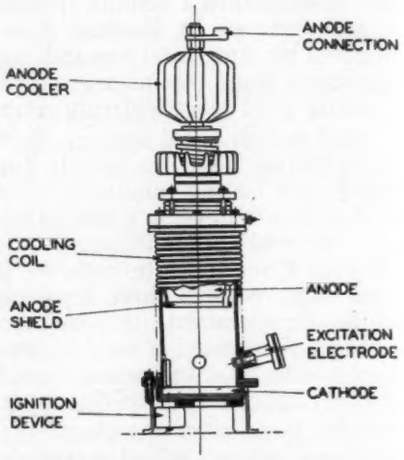
An inherent drawback of conventional rectifiers of the multiple-anode tank type is that arc drop increases with an increase in the size of the rectifier tank or tube. To overcome this a newly developed single-anode tank unit, in which each cathode has its individual tank and means for establishing the cathode spot and arc during each cycle, uses a continuous instead of an intermittent ignition-excitation arc.

In this type of single-anode mercury-arc rectifier the igniter-exciter means does not have to be immersed in the mercury cathode, but can be located so that it is not affected by the main anode arc, which may increase in physical size during disturbances, short circuits and backfires. The mercury level does not have to be maintained accurately. Furthermore, it has been found that a very uniform firing can be obtained under severe operating conditions; in other words, the main arc establishes itself in each individual tank at the proper instant during each cycle.

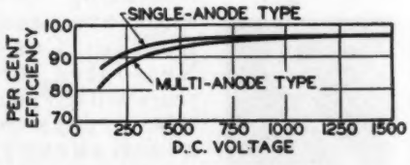
Two six-anode rectifiers, each consisting of six single tanks, and using an ignition-excitation system with a continuous cathode spot for the main arc, were recently built by the Allis-Chalmers Manufacturing Company. These units have a rating of 1,000 and 1,500 kw., respectively, or, if arranged with twelve tanks, 2,000 and 3,000 kw. Construction of the anode and grid assembly is similar to that of the more conventional multiple-anode type.

Grids are insulated from anode and tank and can be energized through a bushing inserted near the anode. It was found advisable to insulate the cathode from the tank and to provide means for easy removability of this plate. The anode plate may be detachable or of welded construction, since the assembly of anode and grid can be made through the cathode opening.

Grids and shields are designed and located so as to provide adequate deionization and baffling. The excitation and ignition anodes are arranged and shielded in such a way that as little as possible additional ionization is added to the residuum holding over during the negative voltage period. Tanks are evacuated with mercury vapor and rotary oil pumps; an end cabinet contains the relays and equipment for starting and control.



ANODE AND GRID ASSEMBLY for new single-anode, multiple-tank mercury-arc rectifier using continuous ignition-excitation arc



COMPARISON of efficiency curves for multiple- and single-anode rectifier of 1,000 kw. rating as function of d.c. voltage shows efficiency of single-anode type, at given d.c. voltage, practically constant for all loads. Capability of single-anode type unit to operate at lower loads with high efficiency is particularly advantageous where load fluctuates, as in hoisting, mill service or other industrial applications.

LOOK FOR THIS TAG ...

THIS IS A
LOCKE
NOISELESS INSULATOR
NP TYPE
It may be used with any type of conductor and will operate without causing radio interference when used at the voltage for which it is recommended.
The META-GLAZE treatment which is responsible for this improvement is permanent and not affected by atmospheric or climatic conditions. It resists abrasion, is not subject to mechanical change or electrolytic action nor does it affect the original electrical characteristics of the unit to any measurable extent.
For better operation always specify
LOCKE
Porcelain Insulators

... *with the insulators you buy!*

It is your assurance of better performance, lower maintenance costs, longer life and freedom from radio interference.

LOCKE INSULATOR CORPORATION
BALTIMORE MARYLAND

LOAD BUILDING

Roasters Build Load For Two Classes

By H. G. VOIGHT
Sales Manager,
Central Power & Light Company,
Corpus Christi, Tex.

When the electric roaster was first put on the market this company saw great possibilities for the sales and promotion of this new load-building device. In this part of the country the people participate to a great extent in outings, and the roaster, of course, was well suited to this type of use because of its convenient portability.

In 1934 we began our promotion with an educational program as a very necessary fundamental. Although our company was selling and featuring electric roasters without collaboration from others, we were able to ring up sales for 136 roasters.

We continued with an all-employee activity each year on roasters, with the result that our sales steadily increased until 1937, when they reached a total of 428.

Beginning in 1938 we expanded our efforts beyond the domestic field and we found that there were more places in commercial institutions that could use the electric roaster advantageously and the roaster seemed to be particularly useful in the small commercial establishment.

They have been used for the preparation of hams in delicatessens and meat markets; cafes and small coffee shops use the roasters as roll warmers. They have been used in the preparation of chili, which is a popular dish in this country. They keep barbecue and other similar foods hot. In fact, their use is so broad that we have not as yet uncovered all of the practical purposes for which the roasters can be used commercially.

Our sales for 1938 amounted to 300 and there were many more roasters sold by dealers who began to appreciate the market which was represented by roasters.

We feel that in the development of the roaster in this area we have developed a market for an excellent builder of load and revenue. We feel, too, that we have created a market that will be attractive to dealers in future solicitation of roaster sales.

It has been our experience that the electric roaster is a stepping-stone to the sale of an electric range. There is some disadvantage to an active roaster promotion in that many electric range users purchase the roasters to use in place of their electric range. It seems that customers whose cooking requirements are not as heavy as the average can meet their needs better with the roaster than they can with the electric range.

Fluorescents Speed Grading by Color

By A. N. NILSSON
Pacific Power & Light Company,
Walla Walla, Wash.

In the processing of asparagus grading by color is an important factor. Grading under normal incandescent lighting has been extremely difficult and suitable correction has been a challenge to lighting experts.

Experiments with fluorescent units led to an installation at the Dayton, Wash., plant of Blue Mountain Canneries, Inc., which proved so successful that it was decided to use this type of light exclusively.

The experimental work was initiated by Frank Herrick, chief engineer for the Minnesota Valley Canning Company and was carried on at Le Sueur, Minn., with assistance from General Electric and the Pacific Power & Light Company, which

THE GIRLS select asparagus for the full-stalk fancy pack from the wide white-rubber belt—fluorescent units mounted in the troughs overhead provide 110 ft.-candles and E.A.R. of $75

Filling Empty Sockets!

Henry Bulbsnatcher's last stand!

Observe the final desperate plight of the chronic bulb-snatcher! He has robbed one socket to fill another until he is down to the last bulb in the house. If anything happens to that we can foresee only the breakup of a once happy home. The one hope is that with no more bulbs to snatch, Henry will begin life anew by treating himself to a flock of new G-E MAZDA lamps.

May we suggest that you do the same thing yourself before you become a slave to the sly habit of bulbsnatching? Check up now. Do the bulbs in each of your reading lamps total at least 100 watts, well-shaded? (Some need more.) Are they made by G-E? The right bulb can make all the difference between comfort and eye-strain! Get the right size—and insist on the G-E monogram!

G-E MAZDA LAMPS ARE BRIGHTER THAN EVER! 100 WATT SIZE AND SMALLER NOW ONLY . . . 15¢
HERE'S TOP VALUE FOR A DIME! 7½, 15, 30 AND 60 WATTS MARKED GE 10¢
G-E MAZDA LAMPS
Made to stay brighter longer
GENERAL ELECTRIC

THIS AD WAS ONE OF THE BEST READ PAGES in the January 6th SATURDAY EVENING POST. And it's one of the best "empty socket" advertisements General Electric has published. Note how it gets over, with a smile, the inevitable result of "bulbsnatching". . . a term, by the way, that is fast becoming a household word. This ad is typical of some 625,000,000 G-E Lamp messages this year . . . an average of at least 26 per wired home. They are helping to fill the empty sockets on your lines. General Electric Company, Nela Park, Cleveland, Ohio.

REVENUE from this lighting installation exceeds $75 monthly

serves the Blue Mountain Canneries plant.

The installation in Washington consists of 50 lamps, each of 30-watt capacity, 36 in. long. Condensers were provided to yield a power factor of 70 per cent.

Sorting is done by workers who select the choice stalks for fancy pack from a wide rubber belt which carries the asparagus past them. The lights, installed just overhead, produce 110 ft.-candles on the sorting belt.

Estimated annual revenue on this installation is $75. Mr. Herrick has stated his company intends to double capacity of the plant next spring and that fluorescent lighting will be used on the new tables as a result of this season's performance.

•

Lighted Golf Range Brings $75 Monthly

Both the proprietor and the electric utility are pleased with the revenue that has resulted from lighting Gunnar Nelson's Golf Driving Range on the outskirts of Rockford, Ill. Patronage at the range since it was lighted for night driving has led Nelson to consider lighting another range on the other side of the city, while Central Illinois Electric & Gas Company reports that revenue from the 20-kw. lighting installation is in excess of $75 a month from a load having a 100 per cent power factor and that is essentially off-peak in character. Lighting at the range operates from dusk to midnight every night of the month.

The installation consists of twelve 1,000-watt beam and eight 1,000-watt wide angle reflectors mounted on eight 18-ft. poles spaced on 45-ft. centers 20 ft. behind the line of tees. Six of the poles are equipped with two narrow-beam and one wide-angle reflector each. The end poles carry only one wide angle reflector. The narrow beam units are mounted on a two-pin crossarm 15 ft. above ground, while the wide angle reflector is located atop the pole. The narrow beam lights are focused at the 200-yd. mark, while the wide-angle units serve to light up the area around the tees.

In adjusting the narrow-beam units it was necessary to turn all of the other lights off and focus one beam at a time on the 200-yd. marker. The installation is served from one 25-kva. single-phase transformer.

•

Infra-Red Speeds Paint Shop Schedules

Manufacturing costs were reduced, appearance of product was improved, longevity was increased, factory space was freed and drying time was greatly reduced through the use of infra-red lamps in the plant of a Duquesne Light customer.

The customer makes letters for advertising signs used on theatre marquees, used car lots, etc. As signs are frequently changed, the letters are subject to constant handling and possible chipping and damage. Thus a tough film of paint was necessary.

The letters are produced in large quantities and under air drying the process required considerable space and as much as twelve hours' time. Due to the long drying period dust particles and dirt collected on the paint, resulting in rejects or inferior finishes.

These difficulties are removed by the new method of drying. The letters, newly sprayed with a beetle-base paint and placed on an endless chain, travel first in one direction on the upper level and back on the lower level. Letters are then dumped into a bin, the entire process requiring only 7½ minutes.

LOWER MANUFACTURING COSTS, better product and vast reduction in drying time resulted from this infra-red installation in Pittsburgh—24 250-watt bulbs, staggered on 10-in. centers, provide E.A.R. of $270

Every house needs
Westinghouse

SELECTIVE LOAD • BUILDING

1. MANAGEMENT ENTHUSIASM
2. REASONABLE INITIAL QUOTAS
3. INTENSIVE DEMONSTRATION AND PROMOTION
4. ADEQUATE SALES COMPENSATION
5. TIME PAYMENT PLAN
6. EMPLOYEE OWNERSHIP

WHAT MAKES ROASTER PROMOTIONS CLICK?

we asked 14 representative utility companies

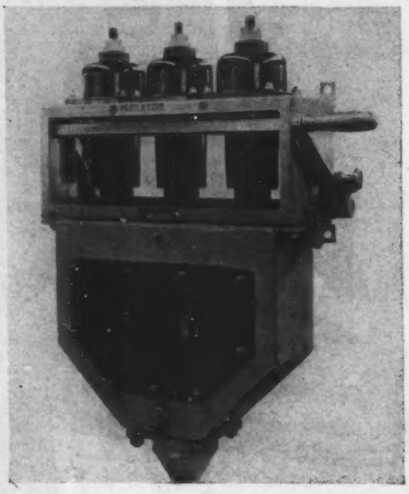
Westinghouse *Electric* Roaster-Oven

ONE OF THE COMPLETE LINE OF WESTINGHOUSE HOME-PROVED APPLIANCES

NEW EQUIPMENT

Cable Isolator

This unit supplements the regular telescoping type of the same rating and is identical with the addition of the pothead unit which incloses terminals for clamping cable. Type of construction is said to permit complete installation to be made without dismembering the isolator and



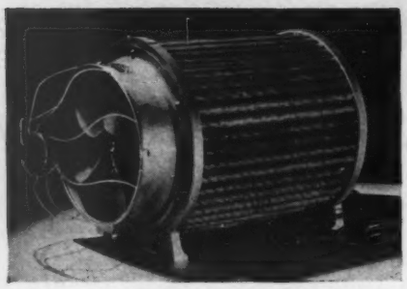
5-kv. cable isolator employing molded bakelite bushings; built in 200, 400, 600 and 1,200-amp. rating. **Electrical Engineers Equipment Co.**, Melrose Park, Ill.

pothead units. Connections are made by removing the front cover plate of the pothead body. Potheads are available in various shapes to meet different installation conditions and are furnished with all standard entrance flanges.

•

Portable Air Conditioner

Featuring but one moving part—the electric motor—it draws in the bad air and delivers the purified air back into the room. An adsorption medium composed of a specially processed, highly activated, granular, cocoanut shell carbon is employed. Two types of units are available, one for installation on any wall or ceiling, where it occupies little more area than an ordinary fan, and the other to be applied to any existing ventilating or air-conditioning system. The former, the squirrel-cage type, is portable and consists of a fan inside a cylindrical-shaped "cage" of closely spaced perforated metal cylinders containing the carbon.



"Squirrel-cage" odor adsorber to be connected to 110-volt system. Dorex Division, **W. B. Connor Engineering Corp.**, 114 East 32d St., New York, N. Y.

•

Splicing Tape

This tape has been developed especially for splicing rubber-insulated cables made with ozone-resisting compounds and, particularly, for such cables operating at over 2,000 volts between phases. In addition, it is claimed to have high moisture resistance and high dielectric strength.

New corona-resisting splicing compound for insulating joints and terminals on high-voltage rubber-insulated cables is an addition to this company's line of tapes. **Okonite Co.**, Passaic, N. J.

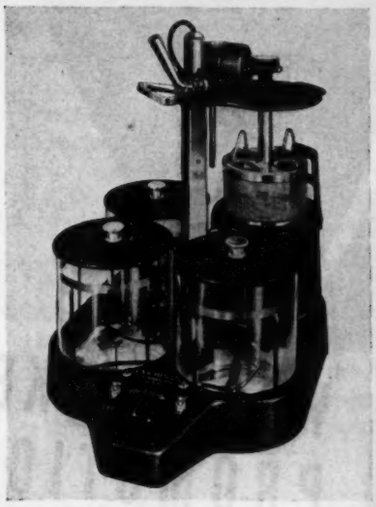
Who Makes What?

"Electrical Buyers Reference;" published annually. **Electrical World**, 330 West 42d St., New York, N. Y.

Names, addresses and products of electrical manufacturers are catalogued in this convenient, annual publication for public utility, industrial, engineering and other major electrical buying interests.

Meter Cleaner

The basket holding the work fits into place on the motor shaft. The central bar, on which the agitator motor is mounted, positions the basket over each solution jar. A rheostat on the base of the machine is used to regulate motor speed, the motor driving the basket through a 14 to 1 reduc-



Instrument cleaning machine and solution; machine weighs 41½ lb. without solutions, for central stations and industrial plants. **Eastern Specialty Co.**, Philadelphia, Pa.

tion gear. There are three cleaning solution jars, containing "Power Nofome," into which the basket is lowered in succession. The fourth position is a heating chamber for drying the parts. Time necessary to complete the cleaning cycle will be between eight and twelve minutes, depending on the metal composing the parts being cleaned, the condition of the parts and the load in the basket.

•

Three Light Bulb

"Select-A-Lite" bulb operates on 120 volts, furnishing 40, 60 or 100 watts. **Jewel Incandescent Lamp Co., Inc.**, 900 Passaic Ave., East Newark, N. J.

The unique feature of this bulb is that it operates in any regular socket and furnishes three intensities by merely turning the bakelite collar on the bulb. It has a new finish called "Eyesaver," which the company claims eliminates the glare at the low, medium or bright light positions.

IN SPITE OF THE MAN WHO SAID—

"THERE'S NO SUCH ANIMAL."

BUT THERE STOOD THE GIRAFFE, AS PLAINLY VISIBLE AS HUBBARD FULL ROUND, TAPERED GUY PROTECTORS APPEAR TO PASSERS-BY. EVER PRESENT—EVER WATCHFUL—GUARDIANS OF THE HIGHWAYS AND BYWAYS.

HUBBARD AND COMPANY

PITTSBURGH — OAKLAND — CALIFORNIA — CHICAGO

HANG THE LOAD ON HUBBARD HARDWARE"

1
Hang it on the wire . . .
2
Drop it, threaded U portion drops down and engages nut.
3
Insert tap wire and thread the connector tight...you get a perfect permanent contact.

L-M DROP-ON CONNECTORS

Save Time And Work On Every Tap-Off, Stand Up Under Highest Service Torques

How easily and speedily you tap a line with the L-M Drop-On Connector is shown in these photos. Note that the nut and body of the L-M Drop-On are always perfectly aligned, ready for threading the instant they come together. Note, too, there are no parts to lose . . . and no loose parts to cause radio interference. • You can use the L-M Drop-On Connector over and over again, year after year. It's built for repeat use. Its rugged body of high strength copper alloy *won't bend under highest service torques* . . . yet the L-M Drop-On design assures a perfect conductor contact at comparatively low torque. Specify the L-M Drop-On in your next connector order . . . you get its extra features at no extra cost.

LINE MATERIAL CO.

Circuit Breaker

The type KB is a more rugged breaker, having a much wider margin between its rupturing rating of 20,000 amp. than the

Three-pole, type KB circuit breaker, improved design of the type K circuit breaker; ratings up to 600 amp. for open mounting or cubicle mounting in switchgear; interrupting capacity rated at 20,000 r.m.s. amperes. **I-T-E Circuit Breaker Co.**, Philadelphia, Pa.

type K and its actual ability to interrupt currents far in excess of that value. It combines contactor features when used in service requiring highly frequent operation.

•

Welding Set

Redesign of the 1,500-amp. constant-potential arc-welding sets for multiple operator and machine welding. **General Electric Co.**, Schenectady, N. Y.

The company claims that the redesign results in more compact construction, lighter weight and greater ease of installation. In addition the control for the motor and generator is mounted on the base.

•

Bookkeeping Machine

The new feature of this machine is the automatic balance. As distinguished from electrification of all operating features of the machine, whereby electricity furnishes the power to drive the mechanism, the automatic balance feature is all electric.

Electrified bookkeeping machine computes and prints balances automatically. **Remington Rand, Inc.**, Buffalo, N. Y.

By means of solenoid relays, electricity now becomes an operating feature, not merely a source of power. A switch control permits the operator to disconnect the electric automatic balance feature at will. Either single or dual cross-computing and printing may be electrically or manually controlled.

•

Glove Bags

Linemen's glove bags to protect rubber gloves when not in use and to make glove readily accessible. **Industrial Products Co.**, Philadelphia, Pa.

Manufactured of conveyor canvas belting, this bag is patterned to accommodate both the rubber gloves and leather protector gloves. Made in 15-in. size, to hold gloves flat, and 9-in. size for gloves which are to be folded at wrist. It features a snap hook and "D" ring for attaching to body belt and is claimed to be waterproof.

•

Volt-Ohm-Milliammeter

This instrument has a wide variety of uses in the electrical and radio fields. There is a potentiometer adustment for change in ohmmeter circuit battery voltage. Change in battery voltage is said not

Model "4922-S" Jumbo volt-ohm-milliammeter; five ranges of a.c. and d.c. volts from 0-2,500; d.c. microamp. 0-500; d.c. milliamp, three ranges from 0-500; ohms 0.05-30, 0.5-10,000; megohm 50-1, 500-10; decibels and output range also. **Hickok Electrical Instrument Co.**, Cleveland, Ohio.

to affect the accuracy of the ohm readings. The device incorporates a new type rectifier circuit, which, it is claimed, will withstand more overload than other types of rectifier circuit.

•

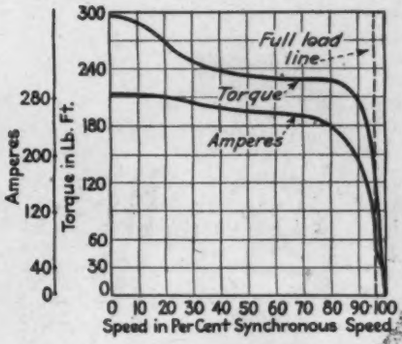
Remote Control

Single, right angle, mechanical remote control for "Varidrive" motors. **U. S. Electrical Motors, Inc.**, Los Angeles, Calif.

This control provides a simple means of selecting the desired operating speed of the motor when it is mounted beneath or above the driven machine or is otherwise inaccessible. An inclosed set of helical right-angle gears makes it possible for the control shaft to be extended at a 90 deg. angle in any one of eight different directions.

Low Inrush Induction Motor

Designed specifically for air conditioning compressor, pump, and fan drives in locations where voltage dip due to motor starting currents is closely limited, is a new high-torque, low-starting current squirrel cage motor which develops 220 per cent locked-rotor torque with a locked-rotor current of 8.9 amperes per horsepower at 220 volts.



"Lo-Amp" motors; 10-200-hp. sizes; designated as type OAN; current-torque curve for 30-hp., 208-volt, polyphase, 1,150-r.p.m. motor of new design, shown. **Louis Allis Co.**, Milwaukee, Wis.

This low inrush current is secured with a specially designed squirrel cage motor without the use of any auxiliary switch or commutator. Usual NEMA Class C motors with approximately the same torques require 40 to 50 per cent more locked current per horsepower.

•

TECHNICAL LITERATURE

ARC-WELDING ELECTRODES—Prepared as a guide for the proper selection of electrodes, the publication also gives important suggestions on welding technique with different types of electrodes and presents some of the factors influencing their choice. Complete descriptions are given of twenty types of electrodes, their applications, sizes, recommended currents, arc voltages, and identification. Illustrated with application photographs, this 40-page publication contains characteristics of deposited weld metal, charts of joint forms and positions, and a handy estimator for electrode quantities. Bulletin GEA-1546F may be obtained from the General Electric Co., Schenectady, N. Y.

GROUNDOMETERS—"Measuring Low Resistance Grounds" is the title of this booklet, which points out proper methods of using groundometer outfits for making measurements of any kind of grounds under practically any conditions. Explains operating ratio, using series resistance, widely distributed grounds—location of reference electrodes, testing in high and extra-high resistance soils etc. Bulletin 152, Borden Electric Co., Summit, N. J.

SELENIUM RECTIFIERS — Tells basically what the selenium rectifier is, gives in Part I its characteristics illustrating by charts and wiring diagrams for circuit arrangement, and shows in descriptive and tabular form its applications. Part II gives tables of Selenium rectifiers. Copies may be obtained from the International Telephone Development Co., Inc., 27 Broad St., New York, N. Y.

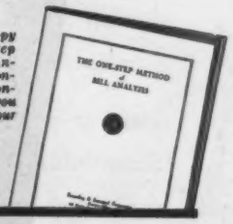
Complete Customer Usage Data . . . at lower cost, in less time, with greater accuracy by the

ONE STEP METHOD of BILL ANALYSIS

If you're planning a rate change, the ONE-STEP METHOD of BILL ANALYSIS will give you a complete check on customer usage, load fluctuations and point out desirable and undesirable angles of your action. Former complicated operation is reduced to a single step. The ONE STEP METHOD of BILL ANALYSIS is much faster than other methods . . . and will save you half, in cost, time and effort! Send for descriptive literature.

The kw.-hrs. billed are entered on adding machine keyboard. A tape is prepared of all items and a consumption total accumulated which serves a control. At the same time—by this single operation—the bill count for each kw.-hr. step is made by electrically controlled accumulating registers.

Write for your copy of "The One-Step Method of Bill Analysis" . . . containing a questionnaire to guide you in describing your particular needs.



RECORDING & STATISTICAL CORPORATION
Utilities Division
102 MAIDEN LANE, N. Y.
BOSTON • CHICAGO • DETROIT
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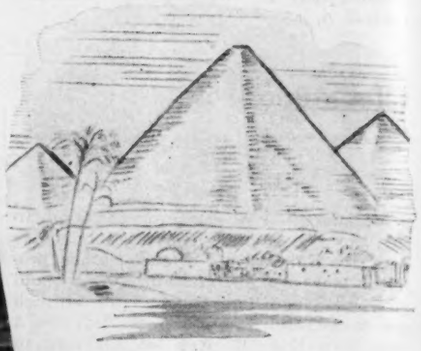
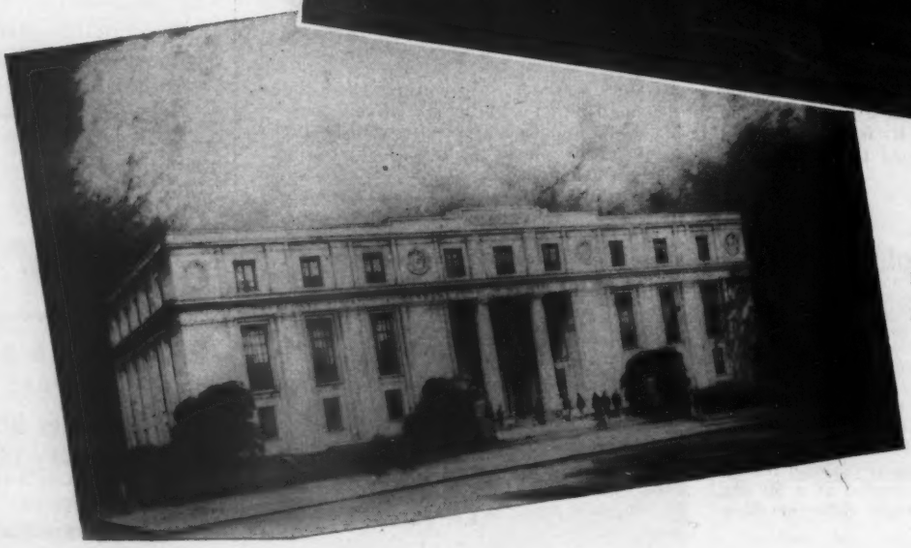
For Buildings that are "Up to Stay"



King's County Hospital Nurses' Home, N. Y.
SYSKA and HENNESSEY
Consulting Engrs.
LEROY P. WARD, *Architect*

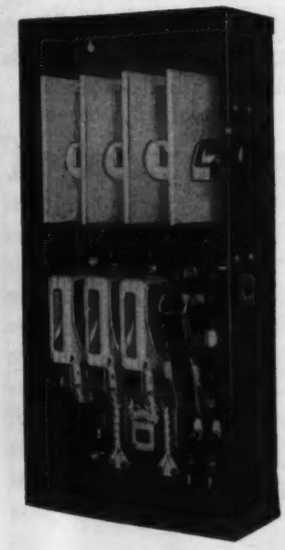
King's County Hospital, Main Bldg., N. Y.
CLARK, MACMULLEN and RILEY
Consulting Engrs.
LEROY P. WARD, *Architect*



Brooklyn, N. Y. Appellate Court House
AMOS T. SMITH, *Consulting Engr.*
SLEE and BRYSON, *Architects*

they Specify Monitor Controls

City Hospital, Welfare Island, N. Y. Chronic Disease Group
TENNEY and OHMES, *Consulting Engrs.* BUTLER and KOHN, *Architects* and YORK and SAWYER, *Architects*



Architects and engineers responsible for the erection and maintenance of truly *permanent* structures are partial to mechanical equipment which has demonstrated an exceptional "life expectancy". So for controlling the operation of pumps, blowers, air-conditioning systems and other motor-driven apparatus in these typical permanent buildings it is only natural that Monitor was selected.

For there's nothing temporary about Monitor Automatic Controls .... From the little ½ HP Starter to the big new 1200 AMP Contactor you'll find that long-lived ruggedness and inbuilt quality characterize every controlling device bearing the name Monitor.

Monitor field engineers in all important cities stand ready to assist you in selecting the most efficient control for your requirements. Consult your phone book or write:

Monitor
BALTIMORE, MD.
The Original
JUST PRESS A BUTTON System

MonitorControllerCompany

Gay, Lombard & Frederick Sts.
BALTIMORE, MARYLAND

NEWS ABOUT PEOPLE

Griffith Resigns P. G. E. Post; Polhemus President

Franklin T. Griffith, for many years president of Portland Electric Power Co., Portland General Electric Co. and Portland Traction Co., Portland, Ore., tendered his resignation as president of the Portland General Electric on February 7, the day after his seventieth birthday. The board of directors accepted the resignation, made Mr. Griffith chairman of the board, and elected James H. Polhemus, executive vice-president, to succeed to the presidency on March 1.

Born in the Middle West in 1870, Mr. Griffith went to Oregon City in 1894 and was admitted to the bar. During the years he practiced law there, part of the time as city attorney, he became division counsel for Portland Railway, Light & Power Co., the predecessor of Portland Electric Power Co. In 1909 he went to Portland as general counsel for

F. T. Griffith

the company. It was in 1913 he was made president, a position he has held ever since. For many years Mr. Griffith took an active part in the affairs of the old N.E.L.A., serving as president 1924–25. Mr. Griffith, as chairman of the association's water power development committee, did work of immense value in furthering the development of water powers in the Northwest. He also is a past-president of the Northwest Electric Light and Power Association.

J. H. Polhemus

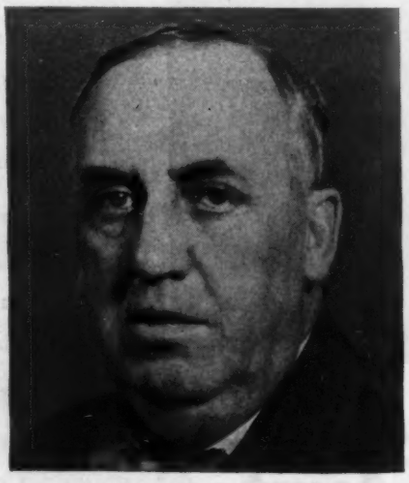
Mr. Polhemus, who succeeds Mr. Griffith as president of the Portland General Electric Co., began his engineering career as field engineer and superintendent of construction for the U. S. Engineers on The Dalles-Celilo canal. In 1914 he was sent to Coos Bay, Ore., to take charge of dredging and harbor improvement and in 1918 he joined the Coos Bay Shipbuilding Co. Two years later he became chief engineer and general manager of the Port of Portland, a position he held until 1936, when he became executive vice-president of Portland Electric Power Co. and its affiliated companies.

In commenting on the executive changes, Mr. Griffith said: "I expect to devote my time to other phases of the company's affairs which, of late years, have multiplied to such extent as to make necessary the executive changes at this time. I believe the changes in executive positions will be of material advantage to the company in many ways. . ."

F. M. Kerr Relinquishes Presidency to F. W. Bird

Frank M. Kerr has transferred the duties of the presidency and general managership of the Montana Power Co. to Frank W. Bird, formerly vice-president and assistant general manager. With Mr. Bird's assumption of his new offices Mr. Kerr becomes honorary president of the company. He also retains his membership in the board of directors.

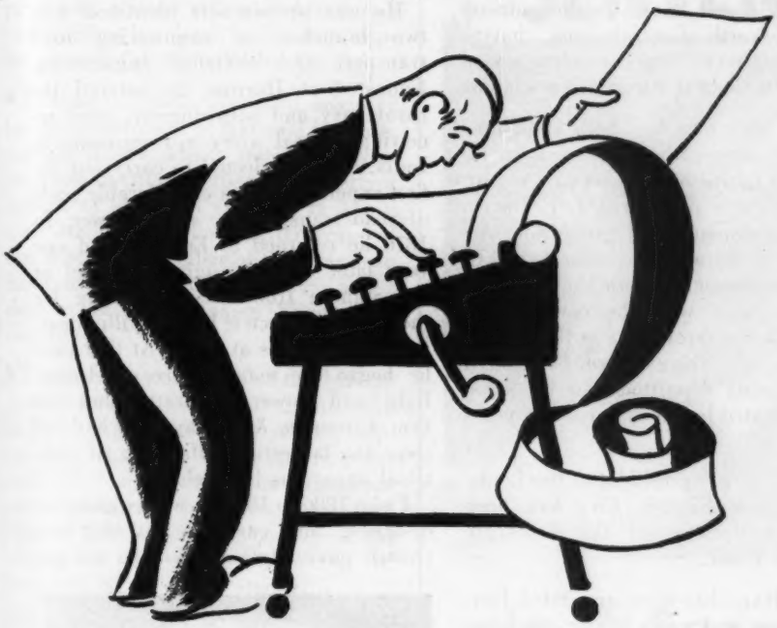
Mr. Kerr has just completed fifty years of service in the electrical industry. To commemorate this occasion he was tendered a banquet at the Finlen Hotel in Butte. More than 200 persons were in attendance. There was an outpouring of affection and esteem for the dean of electrical engineers in Montana. In responding to the tributes paid him, Mr. Kerr first sketched the development of electricity in Montana and then announced his intention of relinquishing the burdens of the presidency and general managership. Among the messages received was a resolution from the board of directors of the American Power & Light Co., congratulating him on his many contributions to the development



F. M. Kerr

FIGURE THE ECONOMIES . . .

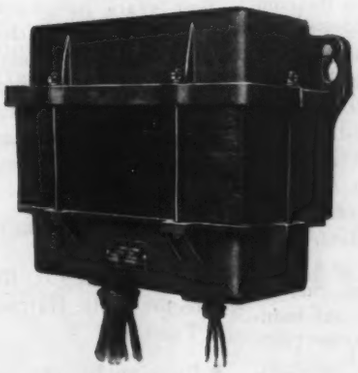
of AmerTran Type "CF" Transformers in Industrial Plants



1. *Obtain 115/230 volts at lower Power Rates.*
2. *Low initial investment.*
3. *Easy to install.*
4. *Minimum Maintenance Expense.*
5. *Efficient in Operation.*

THERE is no necessity for oil, fireproof vaults, enclosures and similar inconveniences when you use AmerTran Type CF Transformers to change your voltage. These efficient units are moderately priced, and, because they are air-insulated and self-cooled, may be installed wherever needed—either indoors or outdoors—without restrictions.

THEY may be used in industrial plants to supply power at changed voltage (600 V. or less) to all manner of small and medium loads, such as lighting, heating devices, small motors, and portable tools. Each transformer is a complete operating unit, requiring no extras and capable of supplying its full rated output continuously with a minimum of maintenance. All sizes are equipped with lugs for wall mounting and conduit fittings for connections, so as to facilitate installation, and both single and polyphase designs are furnished as a single unit. Let us send data on equipment to meet your needs. Ask for bulletin No. 1116A.



Above: AmerTran Type CFT transformers are three-phase units with similar characteristics and features to Type CF described above.

Below: AmerTran Type CF general-purpose, outdoor-type, air-cooled, single-phase transformer. Standard sizes to 15 Kva., 60 cycles.*

★ Similar equipment for indoor service only available in standard sizes up to 150 Kva.

AMERTRAN

Manufactured Since 1901 at Newark, N. J.

AMERICAN TRANSFORMER CO.
178 EMMET ST.
NEWARK, N. J.

F. W. Bird

of the electric light and power industry. A lengthy message was received from Sidney R. Inch, president of Electric Bond & Share, and a wire from C. F. Kelley, president of Anaconda Copper Co., expressed regrets at not being present.

Born in Illinois, Mr. Kerr went West with his father at an early age. Fifty years ago he started the installation of the machinery of the Silver Bow Electric Co., one of the very first electric light companies in Montana. When the Montana Power Co. was born Mr. Kerr became its first general superintendent. In 1915 he became general manager, one year later vice-president and when the late John D. Ryan died Mr. Kerr was elected president to succeed him.

Mr. Bird, the new president, became associated with the Montana Reservoir & Irrigation Co. in 1910. When the company was joined with other enterprises to form the Montana Power Co., in 1912, Mr. Bird became identified with the power company. Since 1932 he has been vice-president and assistant general manager. A native of Ireland, Mr. Bird came at an early age to America, receiving his education in several Canadian universities and at Montana State College. He went to Montana as a member of the U. S. Geological Survey. Since Mr. Kerr became general manager of the power company, in 1915, Mr. Bird has been his able assistant. The two men have labored through the years in complete accord with the single purpose of providing for Montana the best possible utility service.

•

▶ BERT K. NASTER, who is connected with the Electro Manufacturing Co., Chicago, has just been appointed chief engineer of a new commercial fluorescent engineering service. This new service has been instituted by the company to assist its distributors in planning, figuring and designing the most efficient and most modern fluorescent lighting available for all types of commercial installations. Mr. Naster has been in the electrical field for fifteen years and has been active in fluorescent lighting since its beginning.

▶ JOHN W. LAPHAM has resigned as industrial and agricultural agent of the Minnesota Power & Light Co. Mr. Lapham is well known in the industry in the North Central area, having served for many years as secretary of the North Central Electric Association.

▶ J. C. GAYLORD has been appointed superintendent of hydro generation for Southern California Edison Co., reporting in the new position to J. F. Davenport, superintendent of generation. According to the announcement by R. G. Boyles, manager of operation, Mr. Gaylord has been with the company 28 years. After several years in the department of engineering design, he entered the operating department in 1932 and was appointed hydro engineer two years later.

▶ T. B. WILSON, president of the Louisville Gas & Electric Co., has been elected a director of the Louisville Board of Trade.

▶ C. B. HALL has been appointed Hotpoint range and water heater specialist for northern Illinois. Mr. Hall has had thirteen years' experience in the sale and merchandising of Hotpoint home appliances. He goes to Edison General Electric Appliance Co. from the General Electric Supply Corp., Indianapolis.

▶ W. D. HAYLON, who for more than four years has been publicity representative for the Pittsfield, Mass., works of the General Electric Co., has been appointed advertising manager of the G. E. plastic department. He will continue to make his headquarters at Pittsfield. Mr. Haylon replaces N. S. Stoddard, resigned.

▶ AUSTIN D. BARNEY, vice-president and general counsel of the Hartford Electric Light Co., has been elected a director of the Hartford National Bank & Trust Co.

▶ RICHARD HUSTED has been appointed general superintendent of the Anderson Brass Works, Birmingham, Ala. He was formerly assistant general superintendent of Edna Brass Co., Cincinnati, Ohio.

▶ DR. ALEXANDER RUSSELL has been made the recipient of the eighteenth award of the Faraday Medal for notable scientific achievement in electrical engineering by the Institution of Electrical Engineers of Great Britain. Dr. Russell is a past president of the institution. He is the author of a life of Lord Kelvin, famous physicist, and of other works on physics and engineering.

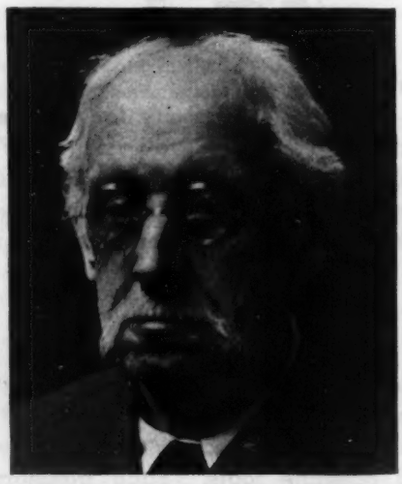
OBITUARY

Col. R. E. B. Crompton

Colonel R. E. B. Crompton, known as the father of the electrical industry in Great Britain, died in London, February 15, at the age of 94.

He was prominently identified with two branches of engineering—road transport and electrical engineering. Educated at Harrow, he entered the royal navy and subsequently, after receiving several army appointments in India, he was selected to carry out the first experiment on a considerable scale of road transport by steam power. In 1876 he returned to England and one year later became engineer-in-chief of the Stanton Ironworks Co., using for the first time electric light for illuminating the foundries at night. At that time he began the manufacture of electric light and power apparatus and his firm, Crompton & Co., by 1886 had become the largest manufacturer of electrical apparatus in England.

From 1886 to 1887 he was engaged in designing and carrying out the first electric power station at Vienna and the



station in London at Kensington Court, the Kensington & Knightsbridge Electric Lighting Co., then founded, being the oldest of the supply companies in England. At the time of his death Colonel Crompton was serving on the board of Crompton, Parkinson & Co., Ltd.

He had served twice as president of the Institution of Electrical Engineers and was a holder of the Faraday Medal. He visited the United States twice, in 1904 and again in 1926 as a delegate to the International Electrotechnical Commission.

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▶ FRED J. CORNFORD, construction engineer, Ohio Power Co., Power, W. Va., died November 5. A native of England, Mr. Cornford came to New York in

1904. He engaged in electrical installation and construction work in various parts of the country for a number of years. He was employed in 1917 by the American Gas & Electric Co. as general electrical foreman of construction at the Windsor power plant, Wheeling, W. Va., and continued with that company and various affiliates. About two years before his death he became associated with the Ohio Power Co.

▶ GEORGE S. DAVIS, electrical engineer for the Department of National Defense, Canada, died suddenly December 29 at his home in Ottawa. He was formerly a consulting electrical engineer in Montreal. Mr. Davis, who was 65 years of age, was a life member of the American Institute of Electrical Engineers and a member of the Canadian Engineering Institute.

▶ THOMAS HAWLEY, one of the leading authorities on steam plant engineering in New England, founder of the engineering school in Boston bearing his name and organizer of the Massachusetts Department of Boiler Inspection, died at Boston on January 20, at the age of 73. He was a pioneer in the development of safety standards.

▶ T. S. PERKINS, widely known in the electrical industry for his long association with it, died in Irwin, Pa., January 7. Mr. Perkins had been in retirement since 1933, when he had held the position of general manager of merchandising engineering of the Westinghouse Electric & Manufacturing Co. Following graduation from Worcester Polytechnic Institute in 1893, Mr. Perkins immediately joined the Westinghouse company and remained with it until his retirement. During his engineering career he was associated in the design and production of many significant electrical developments including radio equipment, relays, meters, arc lamps, lightning arresters, fan motors and watthour devices. Eighteen patents were issued in his name.

▶ DAVID CROWNFIELD, one of the foremost authorities in the East on illuminating engineering, formerly a member of the staff of the then Pettingell Andrews Co., Boston, and lately associated with Irving & Casson, Boston, was found dead in his apartment in Cambridge, Mass., on February 8. He was born in Roland Park, Md., 74 years ago and was educated in this country and in European art centers. He designed many fixtures and installations for churches, colleges and other public buildings and combined to an unusual degree understanding of the engineering and artistic sides of illumination with the capacity to originate outstanding designs in harmony with their purposes and surroundings.

A FIRE SENTENCED TO DIE

In 3 Seconds!

Here's a sure-handed, dependable weapon against fire. It kills blazes with this lightning-FAST extinguishing agent — carbon dioxide snow-and-gas. It spells sudden death to fire! It harms nothing but fire.

LUX extinguishers and LUX Built-In Systems are *engineered for industry* . . . engineered, in fact, *for the utility industry.* The first carbon dioxide portable extinguisher, the first built-in system . . . both were first applied for protection of public utility properties . . . both were developed by LUX.

Electrical and flammable liquid fires—your worst hazards—are no problem in a LUX-equipped plant. Send the coupon. Get the facts now.

← ***Announcing Kidde-LUX***

Easy one-handed operation and trigger action make this new Kidde-LUX Model Two a sensational success against smaller fires. Aim it . . . pull the trigger . . . LUX snow-and-gas smothers the blaze. No pumping to disturb your aim. *Just fire at the fire!* Send the coupon for information on this newest fire-fighter.

LUX
SNUFFS OUT FIRE

Walter Kidde & Company, Inc.
228 West Street, Bloomfield, N. J.

Send me *"Don't Play with Fire."* I understand it describes the new Kidde-LUX as well as other LUX extinguishers.

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Company .....

Address .....

MANUFACTURING - MARKETS

Robertson Predicts Good Business Year

The fear that business must be poor in a presidential election year is unfounded, A. W. Robertson, chairman of Westinghouse Electric & Manufacturing Co., stated during a visit to the Mansfield, Ohio, plant. He predicted 1940 would be a good year, and said the present slight drop in general business is to be expected after the unusual spurt in the last quarter of 1939.

Pointing out that government is a substantial factor in the business cycle, Mr. Robertson said that in an election year government prefers at least mild prosperity. "If general conditions are favorable this attitude of government in favor of prosperity is most helpful."

The company reported net earnings of $4,379,450 for the past three months, of which $1,822,117 was earned in November, $1,498,595 in December and $958,738 in January. On the basis of earnings, employees of the company will receive an upward adjustment of 10 per cent in wages and salaries for February.

Merchandise shipments from Mansfield are running 25 per cent ahead of last year. January shipments totaled 867 carloads, third highest figure in the plant's history, according to Frank R. Kohnstamm, merchandising division sales manager. In January, 1939, shipments totaled 692 carloads.

•

Blaw-Knox Offers New $3,000,000 Bond Issue

An issue of $3,000,000 Blaw-Knox Co. first mortgage 3½ per cent bonds, due February 1, 1950, was recently offered to the investing public. The bonds were priced at 100 and accrued interest.

Net proceeds to the company from the sale of the bonds will be used to retire short-term bank loans amounting to $2,500,000, the rest to be added to the company's cash funds as additional working capital. On completion of this financing the new issue of $3,000,000 of 3½ per cent bonds will constitute the only funded debt of the company.

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Increases Dividend

Directors of the Electric Controller & Manufacturing Co. have declared a dividend of 75 cents a share on the common stock no par value payable April 1 to holders of record March 20. This compares with 50 cents paid in each of the four preceding quarters.

•

Holds Sales Conference

Ilg Electric Ventilating Co. recently held its central district sales conference in Chicago, attended by representatives of the areas from Toledo to Kansas City and from Minneapolis to New Orleans. The consensus was that 1940 looks like a good ventilation year, C. W. Dexter reports.

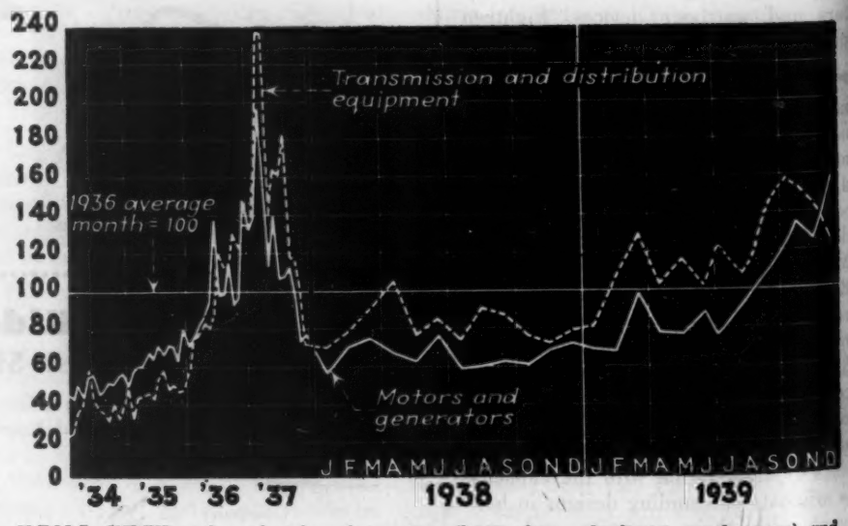
Mixed Trends Shown In Electrical Goods

Orders received for electrical goods in December show conflicting trends, according to NEMA index numbers. The index for motors and generators moved up sharply, by 36.6 points or 29.3 per cent, from November to 161.7. This is more than double the figure a year ago, the increase amounting to 124 per cent. The climb over November was the largest, with one exception, in the past six years, the percentages beginning with 1934 being successively 2.1, 28.4, 52.1, 5.3, 6.7 and 29.3.

In contrast, the index for transmission and distribution equipment de-

Month	Motors and Generators 1939	Motors and Generators 1938	Transmission and Distribution 1939	Transmission and Distribution 1938
January	69.2	57.4	81.0	70.2
February	67.8	70.8	108.3	79.3
March	99.3	74.7	129.1	91.4
April	77.5	66.6	103.0	105.4
May	76.8	62.5	117.2	77.3
June	87.8	76.0	102.0	84.7
July	76.0	59.1	121.2	73.0
August	94.3	60.2	108.8	90.8
September	116.4	62.7	154.4	87.0
October	136.5	61.0	159.8	76.3
November	125.1	67.6	137.3*	73.1
December	161.7	72.1	123.6	79.4

*Revised



N.E.M.A. INDEX, value of orders for motors (large d.c., polyphase, synchronous) and generators (engine, belt-driven); for transmission and distribution equipment

YOUR "LOOKING UP" PLACE FOR 1940

A cross-section of the best practice in electrical engineering

Pender's

ELECTRICAL ENGINEERS' HANDBOOK

Third Revised Edition

HAROLD PENDER, Ph.D., Sc.D.,
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WILLIAM A. DEL MAR, A.C.G.I.,
Associate Editor-in-Chief

KNOX McILWAIN, B.S., E.E.,
Associate Editor-in-Chief

More than one hundred distinguished members of the electrical engineering profession collaborated with the editors in preparing this third edition of Pender's "Electrical Engineers' Handbook." The volumes contain not only extensive quantitative data on all the associated subjects which are needed by the practical engineer, but also articles which can be read with profit by those who wish to bring their knowledge up to date. Each volume covers thoroughly the particular field to which it is devoted. Find what you want with these books.

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Mathematics, Units, and Symbols; Properties of Materials; Electric Circuits, Lines, and Fields; Resistors, Inductors, Capacitors; Electron Tubes; Electromechanical-acoustic Devices; Circuit Elements; High-frequency Transmission; Acoustics; Electrical Measurements; Telegraphy; Sound-reproduction Systems; Telephony; Facsimile Transmission and Reception; Television; Electronic Control and Navigation Equipment; Medical Applications of Electricity; Index.

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440 Fourth Avenue, New York, N. Y.

Please send me the following books on ten days' approval. At the end of that time, if I decide to keep them, I will remit their price plus postage; otherwise I will return the books postpaid.

☐ Pender "Electric Power" $6.00
☐ Pender "Communication and Electronics" $5.00

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Employed by .....

clined 13.7 points, or 10 per cent, from the revised November index of 137.3 to 123.6. Despite the decrease it stands 55.7 per cent higher than it was a year ago. Only one other year of the group mentioned above, 1937, brought a decrease in December compared with November. Again starting with 1934, gains were successively 17.9, 0.6, 10.0, —29.1, 8.6 and —10.0 per cent.

•

Manufacturers Issue Earnings Reports

Reports of operations for the year 1939 have recently been issued by the following manufacturing companies:

ELECTRIC CONTROLLER & MANUFACTURING —Net profit, $158,115, equal to $2.23 each on 70,855 shares of capital stock, against $85,749, or $1.21 a share in 1938. President F. R. Fishback, president, said the company benefited greatly by the increase in business that started in September, and new orders continue at a rate that permits profitable operation.

MINNEAPOLIS-HONEYWELL REGULATOR — Net income, $2,158,582 after all charges, including taxes and year-end adjustments, equivalent to $3.27 each on the 621,900 no-par common shares outstanding, comparing with $1,003,289, or $1.41 a common share, reported for 1938. Sales for the year were $14,004,946, compared with $11,263,631 for 1938, an increase of 24.3 per cent. Current assets on December 31, amounted to $8,695,631, including cash of $3,488,419 and inventories of $3,536,920, while current liabilities were $1,072,275.

•

Supply Contracts Let

Supply contracts were recently awarded by various federal agencies to the following electrical manufacturers:

General Electric, Navy, oil pressure gauges, $18,070; Navy, fuel pressure gauges, $23,050; Navy, manifold pressure gauges, $42,165.

General Cable, War, cable and reels, $160,738.

John A. Roebling's Sons Co., War, cable and reels, $44,491.

•

WPA Electrical Supplies

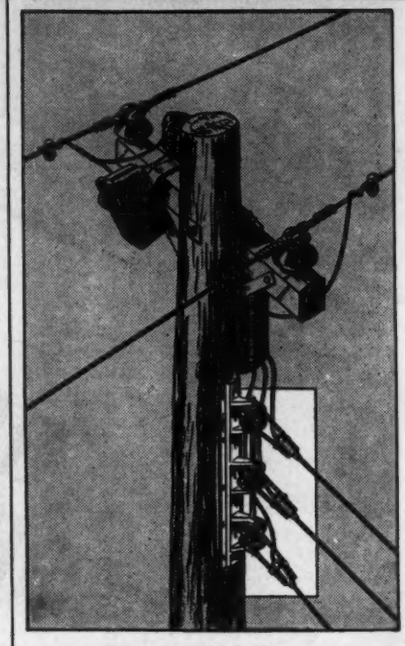
Electrical machinery, apparatus and supplies purchased for use on WPA projects amounted to $23,191,000 during the period from the program's inception in July, 1935, through September, 1939, according to WPA.

New York Metal Prices

	Feb. 20, '40 Cents per Pound	Feb. 14, '40 Cents per Pound
Copper, electrolytic	11.50*	11.25*
Lead, A. S. & R. price	5.00	5.00
Antimony	14.00	14.00
Nickel, ingot	35.00	35.00
Zinc, Spot	5.89	5.89
Tin, Straits	46.125	45.875
Aluminum, 99 per cent	20.00	20.00

*Delivered Connecticut Valley.

modernize YOUR DISTRIBUTION PRACTICE—



Single phase grounded neutral in city distribution.

RELIABLE STRAIGHT-THRU DEAD ENDS

Reliable Straight-thru Dead Ends with flexible clevis are low in cost and permit the use of hard wire in secondaries. They simplify the take-up of slack — easily installed on either strain or spool insulators.

Reliable ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES

Field Reports on Business

There are signs that the decline in business activity is slowing and a base is being formed for an upturn in the spring. Utilities are buying some equipment to get their construction programs under way. There is a diversity of electrical purchases from industrials.

NEW YORK

While many business indices still point downward, indications are that the decline in general business shows signs of moderating. This is especially true in some lines. The rate of decline in steel has grown less, indicating that consumption and production are more nearly in line. Retail sales are being well sustained. The early Easter should be stimulating to buying.

Electrical appliance sales are moving ahead. Norge division of Borg-Warner reports that February schedules on production have been stepped up nearly 23 per cent. Sales of refrigerators, washers, ranges and other appliances were 107 per cent over January, 1939. February deliveries are expected to top those in January by more than 22 per cent.

Oil burners shipments are expected to top 1939 by a wide margin. Shipments during 1939 increased 54 per cent over 1938, reaching a total of 215,030 units.

The severe weather of late has kept utilities on the go to insure service under difficult conditions. The snow has hampered construction, but utilities plan to speed up work when better conditions prevail. A diversity of industrial orders are coming into the market in prospects of higher production demands in coming months.

Business activity in the Pittsburgh district continued to decline rapidly last week, according to the Bureau of Business Research, University of Pittsburgh. The level of business, however, remains substantially above the level early last year and only a few points below the level of February, 1929.

NEW ENGLAND

Business conditions in New England area marked by strong buying trends and are better than a year ago at this time. Utility plans for the coming year are now being made public. President F. C. Abercrombie of the Western Massachusetts Companies stated to an ELECTRICAL WORLD editor that in 1940 approximately $1,800,000 is to be spent for construction purposes largely in distribution and transmission improvements among the constituent properties. Bangor Hydro-Electric Co. plans to expend about $300,000 in routine construction in 1940. In 1939 this company built about 40 miles of rural lines and approximately the same number will be built this year. Domestic appliance sales in 1939 totaled about $274,000, including about 1,200 ranges, refrigerators and water heaters.

New England Power has bought a 30,000-kva. G. E. transformer for the South Street station, Providence. B. F. Sturtevant Co., Hyde Park, Mass., has received an order for mechanical draft equipment from the Indiana & Michigan Electric Co. to be installed in its Twin Branch station with a new 2,600-lb. pressure boiler. The Navy Department has awarded a cable contract to the Collyer Insulated Wire Co., Pawtucket, R. I., for $24,918 and a similar contract to the Rockbestos Products Corp., New Haven, Conn., for $22,197. General Electric Co. will fill a government order for motor-driven fans amounting to $10,371 and will manufacture these in its Bridgeport, Conn., plant. Commercial lighting is active in the Connecticut territory.

CHICAGO

Although the recession in industrial operations became more pronounced last week, the rate of decline in new orders appears to have slowed up considerably. This, and the fact that inventories are at fairly low levels, is the basis of widespread expectations for a turn in the trend early in the second quarter. Activity in most lines is still substantially above the level a year ago.

Department store sales increased sharply last week to 24.4 per cent above the comparable 1939 period. Electrical manufacturers report fairly steady business in lighting and industrial equipment, while major appliance sales are very unsatisfactory, due, in some measure, to the refrigerator price war. Electrical power output declined slightly, as against a small gain in the same week last year.

Of the 38 manufacturers reporting January sales to the Electric Association, 24 show an increase over December, while 33 registered gains over January, 1939. Wire and cable sales are especially good and well above a year ago. Equipment for fluorescent lighting is much in demand and sales mount week after week.

The outlook for new building construction in this area is particularly encouraging. Several large commercial and residential projects, with private financing, are being actively considered, while a number of industrial buildings are already under way or scheduled for an early start.

PACIFIC COAST

Northern California, a typical appliance cross-section of the coast, reports 129,988 radios sold during 1939, with emphasis upon portables and combinations, as against 124,749 in 1938, an increase of 4 per cent. Refrigerators ranked next with 46,775, a 16 per cent increase, while washers, cleaners and sewing machines ranked next, with 10 per cent, 32 per cent and 9 per cent increases, respectively.

New industrial business covers a trial plant in Los Angeles, seven steel frame buildings for Consolidated Aircraft at Los Angeles, Canada Dry's $500,000 plant in Berkeley, $1,000,000 lumber plant reconstruction at Fort Bragg replacing fire loss, and valves, gates and much general steel work for various plants, especially Grand Coulee. National Electric Products Corp. was awarded $105,127 contract, covering 2,000,000 lb. steel pipe and bends for Friant Dam of California Central Valley project.

Sizable orders of varied interest include Bonneville awards of $33,784 for The Dalles, Columbia River, crossing and $11,544 for red cedar poles for the Yakima-Ellersberg sector; a carload of bare copper wire for Indian irrigation service near Parker, Ariz.; 1,000,000 lb. of steel structures for various Bonneville substations and X-ray equipment, valued at $50,000 with a $9,000 installation contract, for San Francisco hospitals.

● Inspection of Miller Electrician's Gloves is no mere routine—it's a ritual. Eyes trained to catch the slightest flaw examine these gloves from cuff to finger tips. They're checked for blisters, pits, presence of foreign material and variance in length and gauge. And they have to be perfect on every count to win an okay.

Add to careful inspection the fact that all Miller Electrician's Gloves are made from pure latex by the Anode process. It's a matter of record that Anode gloves will withstand repeated electric tests over long periods, have high resistance to current leakage, are less subject to tearing and snagging, and possess greater flexibility.

Miller Electrician's Gloves are available with straight or curved fingers for Class "A" and Class "B" service. Write for descriptive literature today.

MILLER RUBBER COMPANY, INC.
AKRON, OHIO

"Engineers in Rubber"

Miller
ANODE
LATEX
ELECTRICIAN'S GLOVES

Sales Opportunities

FRONT ROYAL, VA.—Northern Virginia Power Co., Winchester, Va., plans extensions in 33,000-volt transmission line from Strasburg to Front Royal, close to 12 miles. Company also has authorized expansion and improvements in power substation at latter place, with installation of switchgear, remote control apparatus and other equipment, and will proceed with work at once. This is part of company new construction program for 1940, for which a fund of about $200,000 has been arranged.

CASCADE, IOWA—City Council receives bids until March 12 for miscellaneous electric equipment for new municipal power plant, on which work is under way, including switchboard, bus structure, wiring and other accessory apparatus. Entire project will cost about $110,000. Stanley Engineering Company, Muscatine, Iowa, is consulting engineer.

DALLAS, TEX.—Procter & Gamble Co., Gwynne Building, Cincinnati, Ohio, plans installation of motors and controls, regulators, conveyors, transformers and other power substation apparatus, electric hoists and other equipment in new soap-manufacturing plant at Dallas, where site has been secured. It will include several production buildings, with cost estimated at close to $1,000,000. Work is scheduled to begin soon.

DENVER, COLO.—Bureau of Reclamation, Denver, receives bids until March 14 for three 36,000-kva., 60-cycle, single-phase, oil-immersed, water-cooled transformers, 13,600 to 132,000/230,000 Y-volt, for unit L-3, Grand Coulee power plant, Columbia Basin project, Grand Coulee, Wash. Equipment will be installed by Government (Specifications 896).

OMAHA, NEB.—Nebraska Power Co., Omaha, plans extensions in primary and secondary lines in parts of Washington, Dodge and Sarpy Counties, totaling about 35 miles, for expansion in rural electric system, with power substation and service facilities. Application has been made for permission. Proposed to carry out work during spring.

VIENNA, MD.—Eastern Shore Public Service Co., Salisbury, Md., has concluded financing in amount of about $1,000,000 for proposed extensions and improvements in steam-electric power plant at Vienna, operated in name of Delmarva Power Co., an affiliated interest, recently referred to in these columns, and will proceed with work at early date. Installation will include new turbine-generator unit and auxiliary equipment. Engineering department, Utility Management Corp., Reading, Pa., is consulting engineer.

MERIDIAN, MISS.—Flintkote Co., 50 West Fiftieth Street, New York, N. Y., manufacturer of roll roofing, paper board products, etc., plans installation of motors and controls, transformers and other power substation equipment, conveyors, regulators, electric hoists, loaders and other equipment in new mill on site near Meridian, recently acquired, to be used for production of insulating board and other wood fiber products. It will consist of several buildings, to be equipped for initial rating of over 5,000,000 square feet per month, with power house and mechanical shops. Cost estimated about $2,000,000. Proposed to begin work early in spring, with completion scheduled during first part of 1941.

PORTLAND, ORE.—Administrator, Bonneville Project, Department of Interior, 811 N.E. Oregon Street, Portland, receives bids until March 1 for two oil circuit breakers, 2,500,000-kv., capacity, for Bonneville transmission system (Circular 793).

NEW BERN, N. C.—City Council has authorized surveys for extensions and improvements in municipal power plant, with installation of equipment for increased capacity. Cost estimated about $200,000. Proposed to carry out work in spring.

HOQUIAM, WASH.—Acme Door Co., Hoquiam, plans extensions in power house at millwork plant, including installation of new 1000-kw. turbine-generator unit, boiler and accessory equipment. Work is scheduled to begin at early date.

FRESNO, CALIF.—City Commission plans installation of new electro-lier street-lighting system in parts of Tulare Street and Olive Avenue. Bids will be asked soon. J. L. Vincenz is Commissioner of Public Works, in charge.

CEDAR RAPIDS, IOWA—Iowa Electric & Power Co. has completed plans for addition to local steam-electric power plant, previously referred to in these columns, and will begin work on superstructure soon. Award for building erection has been let to Abell-Howe Company, 53 West Jackson Boulevard, Chicago, Ill. Station capacity will be increased with installation of new equipment. Entire project will cost about $900,000 and is scheduled for completion in fall.

SPRINGFIELD, MO.—Chief Clerk, Medical Center for Federal Prisoners, Springfield, receives bids until March 4 for quantity of armored cable, lighting and power wire, outlet boxes, fuses, switches, panelboard, two gas-fired boilers and other equipment (Circular 135).

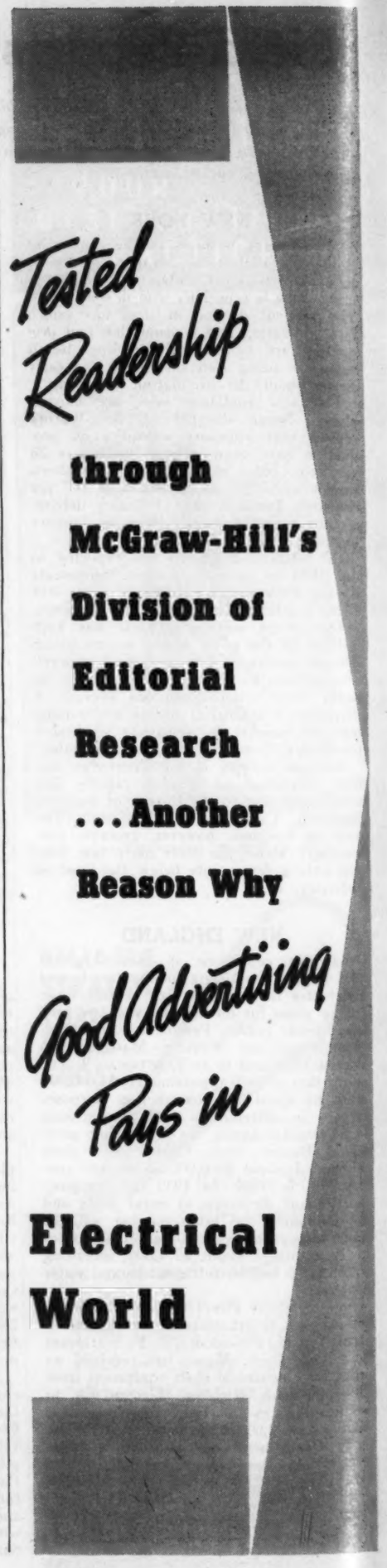
CHARLOTTESVILLE, VA.—Virginia Public Service Co. is arranging fund of about $500,000 for extensions and improvements in transmission and distributing lines, power substations and service facilities during 1940, and will begin active work on program in spring. Approximately $150,000 is being allotted for expansion in primary and secondary lines in rural districts. Total project will provide for service for about 10,000 new consumers in different parts of company territory.

MCALLEN, TEX.—Rio Grande By-Products Corp., McAllen, E. W. Linnard, secretary, plans installation of motors and controls, regulators, conveyors, switchgear and other equipment in new local plant for citrus fruit processing, to consist of several units for large capacity. Cost reported over $400,000. Work will be placed under way soon.

CYNTHIANA, KY.—Kentucky Utilities Co., Louisville, Ky., will proceed with construction of new transmission line from Georgetown to Cynthiana, close to 25 miles, for which plans recently were approved. Cost estimated about $50,000.

NEWARK, OHIO—Ohio Power Co., Newark, will take bids soon on general contract for new three-story headquarters and operating building on Main Street, near First Street, 100 x 128 feet, estimated to cost about $250,000, with equipment.

EAST HARTFORD, CONN.—Hamilton Standard Propeller Division, United Aircraft Corp., South Main Street, plans installation of motors and controls, conveyors, electric hoists, switchgear and other equipment in two new additions to plant, two-story, 66 x 160 feet, and one-story, 80 x 250 feet, respectively. Work will be placed under way at once. Cost estimated over $200,000.



TESTED
A McGRAW-HILL PUBLICATION
READERSHIP

TESTED ADVERTISING, TOO

The records of many years, 66 to be exact, contain plentiful evidence of Electrical World's ability to deliver for the advertiser. Tested Performance also permits us to say, unhesitatingly, that any company which backs a good product with persuasive, informative advertising in Electrical World will get satisfying results.

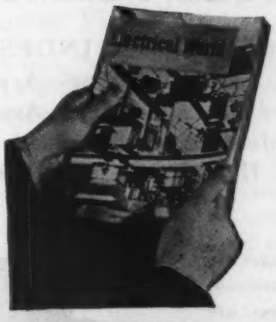
Here's the "report" of two more consistent Electrical World advertisers . . . . .

BREWER-TITCHENER CORPORATION of Cortland, N.Y., presents a most interesting case history. Long and well established in other fields, B-T several years ago came into the electrical industry with a newly developed line of drop forged transmission hardware. The first year a cautious "feeler" campaign appeared in Electrical World. Then B-T hit out confidently with a program of real power and impressiveness.

Now read the comment of W. A. Bruce, Advertising Manager: *"Judge the following results for yourself. In a recent graph of our sales I was astonished to find out how religiously the sales follow the advertising appropriation. Four years after starting our advertising campaign in Electrical World our sales figure was exactly 40 times greater than before we started this campaign. Eight years later it was almost 80 times greater and this in spite of the fact that, nationally, the general purchase of this material was going down rather than up.*

"I will admit that we had a new product and a superior one, and I will also admit that we introduced many new items during this campaign, but I do not feel that you can laugh off the fact that we distributed 3,000 catalogs the year that we stressed these catalogs in our copy, when previously we had only been able to send out 1,000 of them in the three years that we did not stress it in the copy."

BUSSMANN MFG. COMPANY of St. Louis has spent a quarter of a century specializing in the making of fuses, all the while advertising them consistently and well. Small wonder Bussmann enjoys such a fine standing in the industry. H. von P. Thomas, Merchandising Manager, says a lot in two sentences: *"We have carried a consistent advertising campaign in Electrical World because we believe that Electrical World supplies us with an audience we want to reach with messages on Buss Superlag fuses. More than that, we feel that because of Electrical World's consistently good editorial policy this audience is interested in reading Electrical World and incidentally the advertising that the paper carries."*



• Electrical men read Electrical World for the practical help and ideas it gives them—continually. And advertisements that give them the same kind of useful information help produce "satisfying results."

ELECTRICAL WORLD

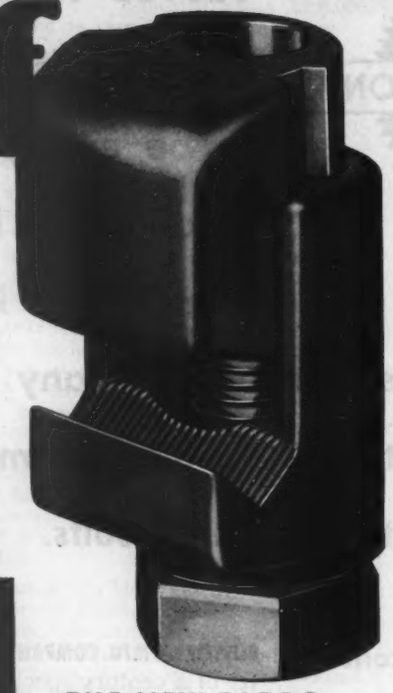
Serving a Huge and Ever-Growing Market

A McGraw-Hill Publication, 330 W. 42 St., N.Y.C.

No. 5 of a series of factual messages designed to demonstrate that GOOD ADVERTISING *in a leading business publication will invariably produce worth-while sales results*

vibration proof

Wind-whipped conductors don't shake loose inside Fargo "6000" Connectors. Fargo jaws are *self-locking* under compression, their grip is permanently slip-proof. That's why the new streamlined, vibration-proof Fargo "6000" eliminates radio interference troubles. Now available in No. 4 and No. 6 sizes. Other sizes at a later date.



MADE BY FARGO MFG. CO.
DISTRIBUTED BY
LINE MATERIAL CO.

THE NEW FARGO "6000" CONNECTOR

The ONE BEST WAY to Construct Your Concrete Manholes is with PENOTE SECTIONAL STEEL MANHOLE FORMS

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These are but a few of the many advantages to be secured by the use of these patented sectional steel forms—there are many others. If you are not using Penote Forms, you are missing an important economy in Concrete Manhole Construction.

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THE CLEVELAND TRENCHER COMPANY
20100 St. Clair Ave., Cleveland, Ohio

Commercial and Industrial Data Sheets for Northwest

[*Continued from page 47*]

In the 1939 series utility companies supplied application data on the following subjects: Boiler for road oil heating; heating of rust-proofing bath; commercial (hotel) cooking; vulcanizer boiler; tire retreading boiler; commercial cooking (hospital); restaurant range; chocolate kettle; stripping for spray residue analysis; chocolate coating equipment; restaurant proof box and enamel baker.

Common to all sheets are data on electrical installation, cost, demand and consumption and production data relating to the customer's operations. For example:

The road oil heater was designed for a 10,000-gal. tank delivering 475 gal. daily at 150 deg., F. Ten kw. of tubular elements, thermostatically controlled, cost installed $458.52. used from 2,200 to 3,000 kw.-hr. per month.

An Idaho garage and tire shop vulcanizer uses 11.6 kw.-hr. per tire including pre-heat and cure. Six strip heaters for this job, rated 10.8 kw. at 230 volts, cost $213.85 plus $50 installation in 26x47-in. generator and 15x32½-in. boiler shell.

A Seattle hospital with 225 beds and 65 bassinets produces 37,151 meals per month with an all-electric kitchen. Total cooking and baking load is 124 kw. plus 13 kw. of miscellaneous motors. Kw.-hr. per meal amounts to 0.337.

A chocolate machine installation at Spokane keeps a 60–75-lb. vat at 150 deg. F. Open coil heaters (2 kw.) and a 200-watt strip heater use about 24 kw.-hr. per day.

To stimulate the preparation of data sheets, the association offers a leather notebook for holding the sheets to every company salesman producing an acceptable data sheet. In addition, at the end of the year's series, all the data sheets issued during the year are to be judged on the basis of their usefulness to power salesmen, and three prizes are offered for the three best: First, $25; second, $15; third, $10.

The association intends to keep the service functioning year after year as long as it proves of value to its member companies and, in the course of time, will hope to cover every unusual heating installation in the territory. Service is offered to utility companies outside the association territory at the same cost paid by member companies. Further information may be had from Berkeley Snow, executive secretary, 707 Spalding Building, Portland, Ore.

The data sheets committee operating the service consists of C. T. Bake-

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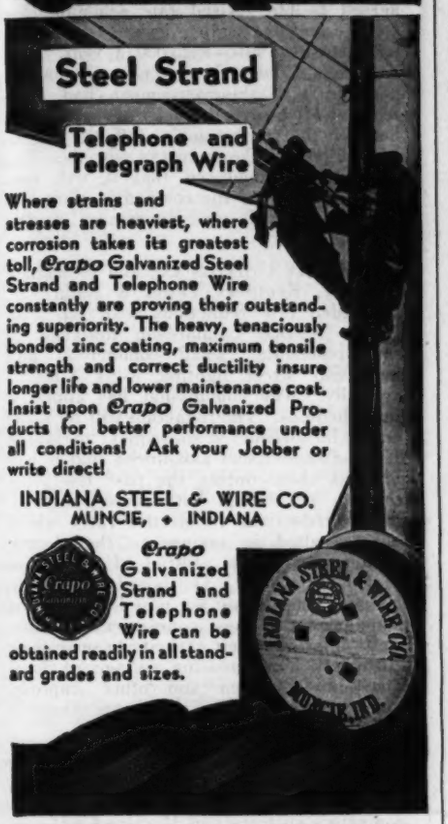

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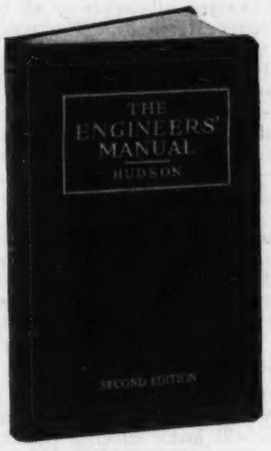

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man, Puget Sound Power & Light Co., chairman; J. A. Lockhart, Pacific Power & Light Co., vice-chairman, and Harold Bulmer, B. C. Electric Railway Co.; D. A. Runyard, California Oregon Power Co.; John A. Clarke, Hermiston Light & Power Co.; Orland C. Mayer, Idaho Power Co.; R. E. McDonough, Montana Power Co.; Harold E. Farris, Mountain States Power Co.; J. C. Plankinton, Northwestern Electric Co.; A. H. Greisser, Portland General Electric Co.; J. H. Shaw, Utah Power & Light Co., and A. H. Wegner, Washington Water Power Co.

Plug-in Devices Promise Easier Maintenance

[*Continued from page 51*]

Details of receptacles, their mounting and adaptation to existing equipment have not been generally agreed on. There are several schools of thought among the men working on this problem. Some are dead set against the idea, while others would modify certain phases to meet what they believe is the industry's desire.

The pictures of actual installations indicate perhaps more clearly than descriptions what progress is being made. At this time it is too early to quote savings or the extent of use that this development should have.

If the fundamental arrangements of this scheme are basically correct, lower costs and greater savings in operation are bound to develop.

•

REA Power Plant

Grand Forks, N.D., will be the site of a $225,000 Diesel generating plant of the Nodak Rural Electric Co-operative, Inc., directors having approved the location at a recent meeting. The plant will serve half a dozen counties in North Dakota and will sell power to Minnesota REA units to be built near Red Lake Falls and Halstad.

•

Wins Safety Medal

Charles A. Trischman, engineer of Virginia Public Service Co., has been awarded the National Safety Council medal for his part in saving the life of a fellow employee. He has also been awarded the "President's Medal" of the Associated Gas & Electric Co.

$38,000.00 SAVED THROUGH ROUTINE TRANSFORMER CHECKING

FIND OUT HOW SUCH SAVINGS ARE MADE— GET THE COMPLETE STORY

★ A large operating company through routine checking with MAX-I-METERS tested 3300 three-phase and open-delta transformers and checked up the connected motor load of 5300 three-phase power customers at an average cost of $2.12 per transformer.

Results: In 90 transformer installations, capacity was removed or reduced by 2060 kva, releasing $18,000 worth of three-phase capacity for use elsewhere on the system. Also, 59 locations were found where the existing transformer capacity was overloaded or had too much connected load endangering 2000 kva capacity or $20,000 in transformers.

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Recent Rate Changes

LOUISVILLE GAS & ELECTRIC CO. has agreed to file revised rate schedules for electric and gas service designed to reduce its customers' bills $325,000 a year. The Kentucky Public Service Commission announced that this agreement had been reached after several weeks of conferences between the commission's staff, the city of Louisville and the company officials. The commission announced that it will continue its study of the company's plant and properties which was commenced in October, 1938.

KENTUCKY UTILITIES CO. and its affiliate company, Kentucky Power & Light Co., have filed rate reductions with the state Public Service Commission designed to save residential, small commercial and municipal street lighting users $180,781 annually. The commission has approved the schedules. The reduction will be made on all bills rendered subsequent to March 1. The commission announced that it had brought about during the past few years through negotiation with these two companies reductions in electric rates which have resulted in savings to the electric customers of these utilities of more than $1,000,000 a year. The board further announced that during the past few years the management of these companies has materially improved their capacity to serve their customers by increasing voltage of local distribution system and other improvements at a cost of approximately $12,000,000.

POTOMAC EDISON CO. has filed with the Public Service Commission of Maryland, revised rate schedules under which the company's customers in Maryland will save approximately $115,000 a year. The reduced charges will apply to all bills rendered after March 31. The reduction is the result of negotiations between the commission, People's Counsel and the company. The revised schedules affect various classes of users of domestic, commercial and municipal service. This is the third reduction in five years. In his letter to the commission transmitting the schedules, R. Paul Smith, president of the company, said: "We are particularly pleased that during the same period in which these three rate reductions have been made, we have been able to extend our service to a very large number of new rural customers and at the same time. improve and modernize the service facilities and equipment of our system. . . ."

OKLAHOMA GAS & ELECTRIC CO. by agreement with the state corporation commission will make effective March 7 rate reductions in 206 towns and cities estimated at $500,000 annually.

NEW YORK STATE ELECTRIC & GAS CORP. has filed with the state Public Service Commission a general reduction in electric rates which the commission permitted the company to make effective February 15 in Oneonta and Norwich and various villages and towns in Broome, Chenango, Delaware, Greene, Herkimer, Madison, Oneida, Otsego, Schoharie and Ulster counties. Savings of $200,300 annually will be realized by customers of the company in this territory as a result of the revised rates, according to an estimate of the company. No customer will be increased by the changes and it is estimated that savings to residential consumers will total $122,400 a year and savings to general commercial consumers will total about $58,000 a year while changes in the power and heating rate will save customers being

served under that rate about $19,100 annually. The corporation has also filed a revision of electric rates which is estimated to save consumers in parts of the Ithaca and the Auburn-Geneva-Newark districts of the company about $72,000 annually. The rates became effective February 15. The company estimates that the savings to customers in the Auburn-Geneva-Newark district will save $64,500 annually and that customers in the Ithaca district will save $7,500 annually.

ERIE LIGHTING CO., Erie, Pa., has announced rate reductions amounting to $832,192 a year.

SOUTH PENN POWER CO.'s new rate schedule is being reviewed by the Pennsylvania Public Utility Commission. The new schedule calls for a reduction in domestic, commercial and street lighting rates for approximately 7,427 customers, totaling $20,930 a year. The reduction is a voluntary one and is intended by the company to become effective April 1. The proposed new rates, as estimated by the company, gives domestic consumers an annual reduction of $12,170, commercial customers $7,380 and street lighting $1,380.

CINCINNATI GAS & ELECTRIC CO. has been ordered by the Ohio Public Utilities Commission to reduce rates to rural electricity consumers 6 per cent. The saving to consumers was estimated at $46,000 annually.

SUPERIOR WATER, LIGHT & POWER CO., Superior, Wis., has reduced its rates in that city $25,533 a year for residential electric consumers. Upon recommendation by a special utility committee which has held meetings with officials of the state public service commission and the company, the city council at a special session unanimously accepted the reduction.

ROCKLAND ELECTRIC CO., which operates in Bergen County, N. J., has reduced its rates $47.285, effective February 1. Residential customers will benefit by $20,872; commercial, $17,115; general power, $3,790 and industrial power, $5,508.

ILLINOIS COMMERCE COMMISSION has announced that electric rate changes effective during the month of January resulted in a total reduction of $19,146.

IOWA PUBLIC SERVICE CO. has announced electric rate reductions to residential and commercial users that will effect savings of $23,000 yearly to residents of Waterloo.

ARKANSAS UTILITIES CO. rate reduction, recently announced, will net customers in Helena, West Helena and Marianna savings of approximately $23,892. The electric rate reduction will amount to approximately 10 per cent to residential consumers and 8.3 per cent to commercial customers. Water rates to Marianna customers also will be reduced 6.3 per cent or approximately $3,703 annually.

•

Put Off Standards Hearing

In response to requests from several utilities for additional time, the Wisconsin Public Service Commission has postponed its hearing on proposed revision of standards for electric service for Wisconsin public utilities from February 8 to March 20.

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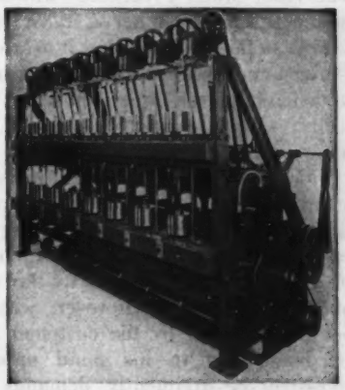

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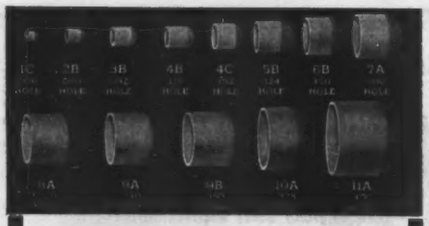

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LETTERS TO THE EDITOR

Statistics Renew Faith

To the Editor of ELECTRICAL WORLD:

The 36th Annual Statistical Number of ELECTRICAL WORLD gave me such an interesting evening that I feel constrained to give you my reactions:

You have dished up the statistics of the industry in a most interesting and comprehensive manner. You furnish renewed faith in the industry because you make it proud that we have had some little to do in bringing about the achievements that you record. Your advertising section also is most attractive and I feel sure that those who have announced their wares therein will not be disappointed with the results!

My congratulations!

TOM P. WALKER, Vice-President
Gulf States Utilities Company,
Beaumont, Texas.

•

Precision Demanding Customer

To the Editor of ELECTRICAL WORLD:

Your editorial "Demand Meter versus Watt-Hour Meter Precision," which appeared in the December 2, 1939, issue, is good so far as it goes, but it overlooks the customer, who perhaps does more in demanding the precision which the utility company must demand of the manufacturer than anyone else.

Differences of a few per cent in meter accuracy may seem trifling to the utility company and may frequently represent only a few pennies in so far as the over- or under-charge to the customer is concerned. However, when a test is demanded by the customer and the inaccuracy in his mind appears excessive, he frequently demands refunds over long periods of time, and failure to comply with his wishes merely makes another enemy for the utility company.

The problem resolves itself into first educating the public.

G. W. FUCHS,
Philadelphia Electric Company,
Philadelphia, Pa.

•

Machine to Clean Meter Parts

To the Editor of ELECTRICAL WORLD:

We beg to call your attention to a news item, on page 57 of the December 16 issue of the ELECTRICAL WORLD, re-

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porting the meeting held by the Pennsylvania Electric Association at Altoona, Pa.

Under "New Cleaning Machine," you report a machine for cleaning developed by the Illinois Watch Company. This is in error. It should read, "developed by the L & R Manufacturing Company, Newark, N. J., and distributed exclusively by the Eastern Specialty Company of Philadelphia."

We are fearful that inquiries will go to the Illinois Watch Company and, naturally, they know nothing about this particular machine.

EDWARD M. CORNELY, President,
Eastern Specialty Company,
3617 North Eighth Street,
Philadelphia, Pa.

•

Consumed Volts Instead of Kilowatt-Hours

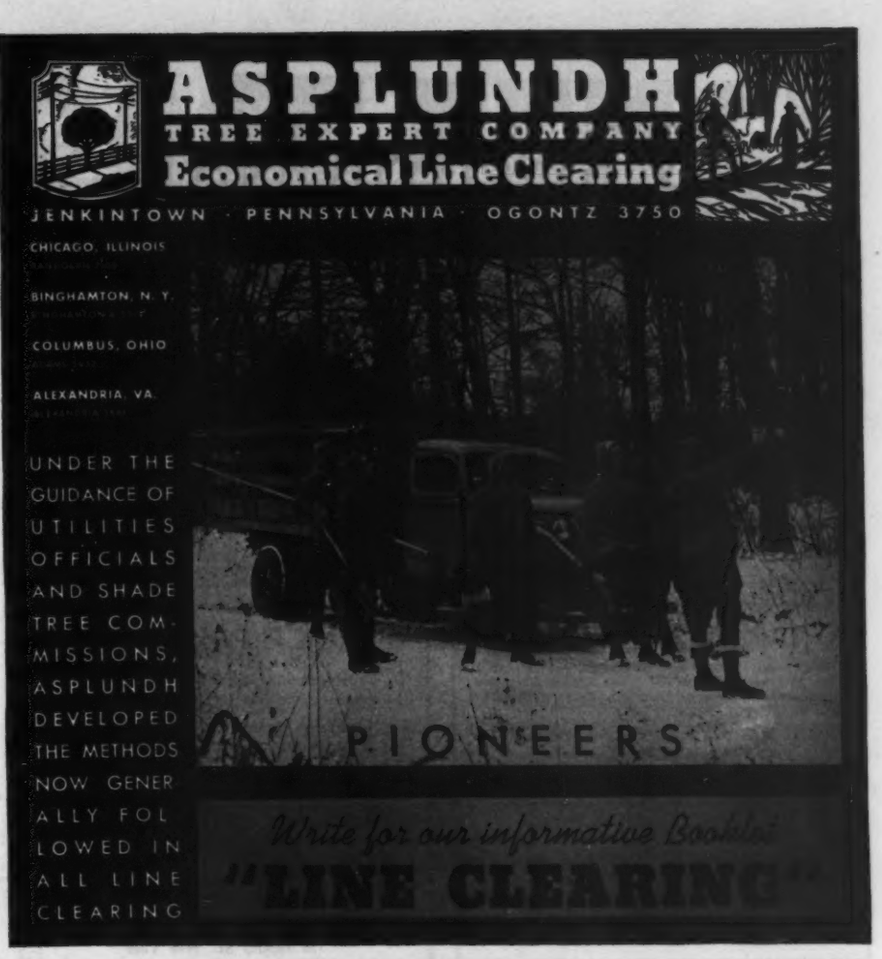
To the Editor of ELECTRICAL WORLD:

The problem of establishing a relation in the mind of the electricity user between the essentials of the service he has received and the units for which he pays is one that has received considerable attention of late, but has not been solved to the degree that would put it upon a comparable basis with gallons of gasoline, pounds of flour and similar measurements of ordinary commercial items.

The greatest hindrance to arriving at a solution to the problem lies in our adherence to terminology of long standing. Run over in your mind for a moment the complications involved in explaining a kilowatt-hour to a person totally uninformed about electricity. And after you are through you may have thought of such items as amperes, volts, watts, time, but not one of them had any bearing upon the essentials of the service rendered.

Let's forget all of our preconceived ideas as to names and terms and use only those which are essential to explain the service we are rendering. What is that service? Why do we have generating plants, transmission and distribution lines? To sell electrical energy, true, but is that all? No, primarily we are selling a difference of electrical potential, a voltage, if you wish to call it such, capable of operating any and all appliances or lights he wishes to use at any time he may wish to use them. What expenses do we have that come within our plant operations that are not for that one purpose? Volts—they are the key to the whole problem.

Strange, but fortunately so, our customers are acquainted with this fact. Of all electrical terms, volts or voltage are the most universally known and used. True, they may at times be in-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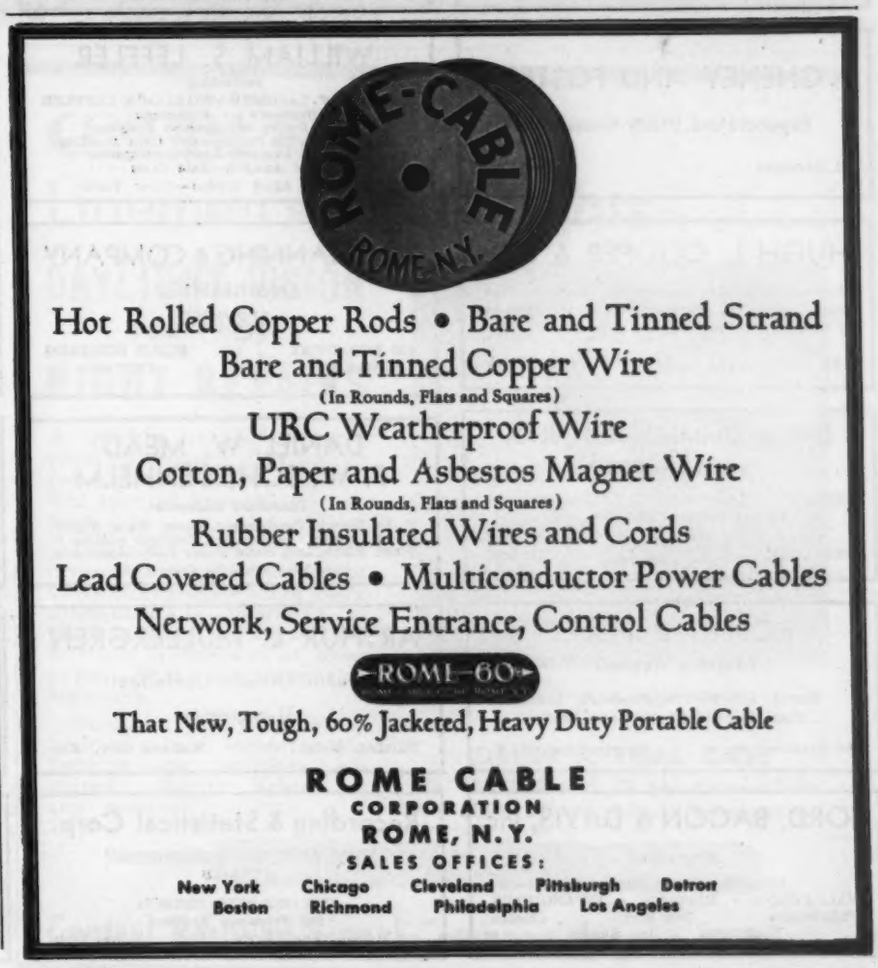
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correctly used, but the general idea that the voltage must be right for equipment to operate properly is prevalent.

Fundamentally a volt is an energy unit and may be equated to watt-hours. In place of watt-hours the term "consumed volt" has reduced every essential item of our service to the least common denominator. Now let us see how we would explain a "consumed volt." What do we have at your light socket? A constant voltage. When you turn the switch, what happens? The light starts using volts and our generators have to replace them immediately or the light would go out. Our wires have to be large enough to let those volts come from the generator to your house. But you only pay for the volts you use. Of course it takes time to use up all the volts you pay for and all equipment doesn't use the same amount. For instance, your IES lamp on bright uses 300 volts an hour, but when on medium uses only 200 volts an hour.

Don't confuse the voltage rating of your light with the volts you use. That rating is merely to make sure the equipment you use is for the voltage we maintain, for otherwise it would not operate properly. If we merely maintained a voltage into your house that you never used we would not require any more or larger wires than are used to serve your telephone. It is when you start using that voltage and therefore using volts that we must have large power plants and big wires to keep the volts coming to your house practically instantaneously so that our voltage will always be the same as the voltage rating of your lights and appliances, regardless of the number you turn on at one time.

The above paragraphs merely contain a rough idea as to how the terms "consumed volts" could be applied, but what other explanation of the energy sold could be so simple and still visualize so completely all elements of the service it represents? We have been selling volts for years; the public really knows we are selling volts, but we persist upon calling them kilowatt-hours, to the confusion of our customers and ourselves.

K. G. FINLEY,
Meter Foreman Spokane Division,
Washington Water Power Company.

[Strangely enough this letter represents the third time this subject was brought to our attention in the past two weeks. Once from the Middle West, once from New England and now from the Pacific Coast. All seem to agree that the term kilowatt-hour is not and cannot be understood by the public. Mr. Finley's suggestion might give us some confusion and he seems to anticipate that in his next to the last paragraph. The term that seems to fit all of Mr. Finley's

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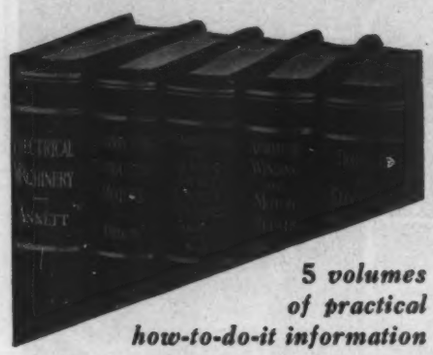

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objections, yet without the attendant confusion, is "kilowatt." Using this as the energy unit we can translate a 100-watt lamp (1/10 kilowatt) into usage very easily. We expect to present more on this later—EDITOR].

Rivesville Topping Reduces B.t.u. per Kw.-Hour One-third

[*Continued from page 36*]

high speed of the turbine, 3,600 r.p.m. This was effected by heating the bracing during field erection, before bolting and riveting it in place. The foundation is made entirely of steel, to minimize dimensions and weight and to avoid the necessity of any other sub-foundation than the concrete water tunnels. Its width is 17 ft., with a height of 31 ft., and operating experience shows it to be entirely satisfactory.

Dynamotor Supply for Graphics

The usefulness of recording power house instruments is often greatest during periods of disturbance, when they may be inoperative if electrically driven. At Rivesville the convenience of electric drive was retained, with high reliability, by installing an automatically controlled dynamotor. On failure of the regular supply the dynamotor starts up on the d.c. end, from the storage battery, and supplies the a.c. instrument drives. Actual system disturbances have shown the value of this arrangement. The station contains many motor-operated steam valves. These are supplied from a separate battery, to reduce the possibilities of trouble on circuits connected to main control battery.

The new auxiliary transformers are filled with inert liquid instead of oil, to minimize fire hazard, as local conditions dictated the installation of these transformers in the switchhouse basement. The very corrosive nature of the river water, previously referred to, made it advisable to use self-cooled transformers in the new 25,000-kva. bank, a type somewhat unusual in this size. Some of the old transformers were modified to eliminate water cooling and substitute fan-cooled oil cooling coils.

Other electrical features of the expansion are shown on page 70. The design and construction of the Rivesville extension was done by Sanderson & Porter, under the general supervision of American Waterworks & Electric Company.

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(Continued on opposite page)

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